# The Chemical Age

**A Weekly Journal Devoted to Industrial and Engineering Chemistry**

VOL. XXXII. January 5, 1935 No. 810


# Notes and Comments

## A New Year Message

LIEUTENANT-COLONEL J. COLVILLE, M.P., secretary to the Department of Overseas Trade, sends us a New Year message in which he says: "The keynote of British outlook in the New Year may be summed up in the word 'Confidence'—that is, confidence in the ability of the British Empire to maintain its high position politically, commercially and industrially. This confidence has been encouraged in no small measure by the Ottawa agreements between ourselves and the British countries overseas and by the more recent commercial agreements now made with thirteen foreign countries. These agreements are having their effect. We are to-day selling more goods to the Empire countries and in most of the great foreign markets of the world than we were a year ago. No fewer than sixty countries have already accepted our invitations and will send their buyers to the 1935 British Industries Fair, which promises to be larger in size and wider in scope than any previous fair. Year by year, the fair has become more important, and to-day it is a powerful instrument for increasing the sale of the products of our factories and workshops throughout the world."

It is announced that a considerable number of buyers from the Irish Free State will attend the British Industries Fair which opens in London in February. More than 150 of them have already intimated their intention of visiting the fair, including 82 from Dublin and 20 from Cork. A number of large stores will be represented. The goods in which they are specially interested are chemicals, and pharmaceutical goods, furniture and furnishings, stationery, leather and fancy goods, art pottery, toys, games and sports goods, textiles and clothing. At the engineering and hardware section, opening at Birmingham in May, the visiting buyers from the Free State will pay particular attention to plant for industrial processes, machine tools, hardware, mining and general engineering, and building materials.

## "The Chemical Age" Year Book

IT'S good, but we expect it to be good if it comes from THE CHEMICAL AGE. This tribute to the 1935 edition of THE CHEMICAL AGE Year Book is typical of a large number we have received from subscribers and advertisers, all of whom should by now have received their copies of the Year Book. It is our aim year by year to make it of increasing practical use, and the generous compliments expressed in the acknowledgments so far received go to show that our claim that the edition surpasses previous efforts is not an exaggerated one. The information contained in the literary section has been further developed, whilst the announcements of advertisers, coupled with the comprehensive buyers' guide section and the advertisers' "Who's Who" will, we hope, provide readers with all the data they require when searching for sources of supplies. The number of organisations in, or associated with, the chemical industry shows a further increase, and it is of statistical interest to note that the total membership of all the societies included in the 1935 edition is no less than 143,791. This figure, however, is no guide to the number of persons engaged in the industry, for there is an enormous amount of duplication, a high percentage of the leading members of the industry being members of two or more institutions. Indeed, one of the principal advantages of the much-discussed co-ordination or amalgamation of societies would be the revelation of a more accurate estimate of the number of persons who have made chemistry their life's work.

Extensive revisions have been made in the list of principal chemical officials in Great Britain and the various research organisations, features which make the Year Book of value as an everyday book of reference. The "Bibliography for the Chemical Industry" has been overhauled, and some 97 new additions have been made since the beginning of 1934. Suggestions received from readers during the year have formed the basis of alterations and corrections in the "Handy Tables" and no effort has been spared to make the Year Book a reliable guide to all who serve the industry. We are conscious of many omissions and shortcomings, and we cordially invite readers to submit further suggestions in order that they may be filed for adoption later in the year when we return to the pleasant task of preparing the next edition. May the 1935 Year Book be constantly of service during the New Year, which we hope will be one of great happiness and prosperity.

## Sulphur is Facing a Crisis

PERUSAL of Mr. M. P. Applebey's recent paper on "Recent Developments in the Chemistry of Sulphur" leads to the reflection that another raw material of the chemical industry is facing a crisis. Most chemical processes depend at one stage or another upon acids; sulphuric acid is the most easily procured of the acids, and the cheapest. Thirty per cent. of the output of sulphuric acid in Britain was formerly used for the manufacture of sulphate of ammonia.

To-day, in spite of strenuous efforts, no satisfactory method has been found for the use of the ample supply of sulphur contained in coal. Nevertheless, gypsum

now supplies the necessary radicle without the interposition of the acid maker, and Mr. Applebey is able to say that sulphate of ammonia is as often as not made without sulphuric acid. There are many acids cheaper than sulphuric, could they be used. One of the cheapest is silica and another is carbon dioxide. Processes are ready whereby the $CO_2$ contained in coal gas can be used to recover the ammonia in the form of ammonium bicarbonate, and it is only the low price of sulphuric acid that has prevented these processes from being put into effect in this country as they have been in Germany. Silica, as an acid, usually requires a high temperature, and there are signs that the electric furnace method of breaking up phosphate rock may lead to the substitution of silica for sulphuric acid. Cost of sulphur prohibits the general use of sulphur for making sulphuric acid in England and in many Continental countries, and gasworks oxide, sulphurous ores and so forth are primarily used.

This leads us to another curious fact upon which we should much like to be enlightened by correspondents. It happens that imported sulphur usually contains less than 0.005 per cent. of arsenic. For this reason, apparently, there seems to have grown up a custom in the trade to demand sulphur with a maximum of 0.005 per cent. of arsenic, even for such uses as vulcanising rubber, for making commercial sulphuric acid, and for nearly every other use to which sulphur is put. Sulphur with 10 or even 100 times as much arsenic as this is not injurious to health. In Germany sulphur containing 0.05 per cent. of arsenic produced at home sells readily to industry and for a higher price than the imported article containing less than 0.005 per cent.; we have ourselves seen this high-arsenic sulphur on sale to the public in chemist's shops in Germany. Why is it that the Germans are satisfied with a much higher arsenic content than we are? The matter is not unimportant since there exists a process by which most of our sulphur requirements could be obtained at home, if we were satisfied to use the grade of sulphur that sells in Germany. Are we out of date in our sulphur specifications?

## Ammoniated Peat

REFERENCE was made in these columns recently to the announcement that the United States Bureau of Agriculture had begun an experiment with a new material known as ammoniated peat, and in view of the present position of by-product ammonia it was suggested that the discovery might prove to be the forerunner of an ammonia "Box and Cox" act. Peat contains in the wet state large amounts of water, in some instances there is as much water as peat. Even apparently dry peat may contain 40 per cent of water. By varying the moisture content of the peat, the pressure and the temperature, products containing up to 22 per cent. of ammonia, have been obtained. The fixation of ammonia in the peat is improved by the addition of carbon dioxide, as would be anticipated. This is interesting since there is a proposal to cease manufacturing sulphate of ammonia on carbonising plants and to sell ammonium bicarbonate instead, the carbon dioxide always present in the gases serving as the acid radicle. At the moment the process appears to be so complicated as to make the probable cost higher than would be entailed by the use of sulphuric acid. The method as described in our columns for October 27 involves a pressure of 100 atmospheres and an autoclave capable of being heated to 300° C. Further experiment may show that a satisfactory product can be made by submitting the crude coke oven gases to wet peat under pressure. We have plenty of peat in this country, and the use of peat on the land would be likely to lighten the soil and to improve it agriculturally. Clearly, the experiments are as yet in their earliest stages and the United States Bureau of Agriculture is more concerned with finding a better artificial manure than with assisting the carbonising industries.

## Indian Chemical Imports

A MARKED improvement in Indian industrial activity is indicated by an increase from £948,750 to £984,625 in the value of imports of industrial chemicals during the six months ended September 30, 1934. Sir Thomas Ainscough, the senior British Trade Commissioner, in a survey of the import trade of India during the first half of the current financial year, expresses the view that the resilience of the chemical trade in face of the severe industrial depression and reduced purchasing power has been remarkable. No details are available of the countries of origin, but the survey gives particulars of the total imports under each of the principal headings, and shows outstanding increases in the imports of sodium carbonate (£255,000 against £223,125 in the corresponding six months of 1933), caustic soda (£168,750 against £125,625), bleaching powder (£41,250 against £33,750) and acids (£37,500 against £26,250). There was, however, a noticeable decrease in imports of potassium chlorate from £46,875 in the first half of 1933 to £24,375 in the first half of 1934.

Materially increased imports of miscellaneous drugs produced a rise in the total imports of drugs and medicines from £626,250 to £676,875. The total trade in paints and colours fell in quantity from 195,191 cwt. to 162,674 cwt., but rose in value from £249,375 to £258,750. The United Kingdom share fell slightly in quantity from 82,653 cwt. to 82,518 cwt., but rose in value from £163,125 to £168,750. The soap trade fell quantitatively from 148,180 cwt. to 144,875 cwt., but rose in value from £279,375 to £311,250. The United Kingdom share rose from 114,958 cwt. to 126,706 cwt., and increased in value from £230,625 to £270,000. After the severe decline in the dyestuffs trade during the past few years it is most encouraging to note that the total imports of dyes during the half year rose from £669,375 to £1,057,500 in value. Details of the countries of origin are not available, but information is given regarding the total imports from all sources under each main heading. Alizarine dyes increased in value from £54,375 in the first half of 1933 to £78,750 in the first half of 1934; Congo red from £18,750 to £61,875; coupling dyes of the naphthol group from £123,750 to £198,750; vat dyes from £234,375 to £335,625; sulphur black from £33,750 to £45,000; and metanil yellow from £9,375 to £26,250.

### Pyrites Utilisation in Italy

SULPHURIC acid in Italy is produced chiefly from pyrites. Eighty-three per cent. of the 1933 output was mined by one concern, the Montecatini. Owing to the high cost of the land haul from Italian pyrites mines to certain acid plants, Spanish pyrites can be delivered cheaper than domestic, while Montecatini ships pyrites to Balkan and other Mediterranean markets.

# Separation of Solids from Liquids

THE separation of solids from liquids was the subject of a paper read at a meeting of the Institution of Chemical Engineers held in the Chemical Society's Rooms, London, on December 19. The joint authors were Dr. Wm. Cullen and Mr. H. T. Durant. They stated that thickening or de-watering of pulps and aqueous suspensions is daily increasing in importance in a number of industrial and metallurgical operations. Partial de-watering is now essential in the accurate control of the concentrations of flotation circuits and in those such as cyanidation where counter current working necessitates a limitation in volume. Complete de-watering is necessary in the recovery of many aqueous concentrates, in slime treatment and in the effective separation of solids from liquids of low solid content, such as colliery and sewage effluents, scrubbing-waters from power plants, and from a wide variety of suspensions in the cement, ochre, ceramic, carbide and other chemical industries.

Thickening and de-watering systems, apart from those involving classification, may be regarded as belonging to three main classes, namely, those which operate by (1) natural settlement, or sedimentation, with decantation of the cleared liquid; (2) filtration methods; and (3) centrifuging.

### Some Disadvantages

Although economical in operation, sedimentation plants have disadvantages in that (1) the decanted liquid is not completely or positively clarified and may for some purposes require passage through a clarifying press, and (2) the area demanded and the first cost and installation of the settling tanks, which in some instances may exceed 300 ft. in dia., with a central depth of 30 ft., is often considerable. The solid to be separated must be amenable to sedimentation with or without previous flocculation: there are solids which are not.

Under the second heading may be included (*a*) thickeners which employ submerged filter elements operated by pressure or suction, from which the cake is periodically displaced by a reversal of current and/or air under pressure; and (*b*) the large class of pressure or suction filters, such as the leaf, disc or drum types, whose province it is to produce a cake of low moisture content, through which air is passed in the final drainage stage. In both of these the liquid is, of course, nearly always positively cleared, whilst by substituting forced filtration for slower and more bulky sedimentation methods, greater compactness is gained. The main source of trouble in all filtration systems is the maintenance of the efficiency of the filter-cloth. Since filtration is nearly always effected by pressure difference, the texture interstices of the filter fabric tend to become choked with solids, which from time to time require removal by thorough washing, occasionally with a solvent. Where the filter cake is disrupted from the cloth by reversal of current or pressure, the fabric is apt to balloon and to deteriorate by strain along its areas of attachment. If the cake be removed by shearing, factors of wear, texture deformation, and the risk of direct damage, are to some extent introduced. Where a large area of filter cloth is concerned, its repair or replacement may entail a lengthy stoppage.

The Blomco thickener utilises a novel yet simple construction and design of filter medium in eliminating these disadvantages, and appears to constitutes a new departure in thickening and filtration technique.

### Importance of Flocculation

The importance of flocculation may be stressed, in respect of a majority of suspensions to be thickened, whether by gravity methods or filtration. Pulp solids will usually have a wide range of diameters, which may extend from the order of 60 microns for larger particles, down to about 0.1$\mu$ for the smaller, where they may begin to be classed as colloids. Those of larger diameters will, of course, fall through water, when unhindered, at rates varying with their diameter in accordance with Stokes' law; while those approaching the lower limit may exhibit Brownian motion, their settlement being retarded by other distribution factors. For particles of such wide diversity in settling rate, the efficiency and uniformity in sedimentation will be very greatly benefited by their collection, through flocculation, into averaged and larger aggregates.

## A New Thickener with a Novel Feature

The advantages of flocculation are equally pronounced in filtration. Whilst the filter septum acts less as a direct-or primary strainer for the solids than as a supporting medium upon which the true filter bed, a composite of the particles themselves, builds up, the latter, nevertheless, may soon become impermeable if it carries or arrests an undue proportion of finely divided solids. The mesh of the fabric being too coarse to stop such particles, these will pass into the filtrate until an effective filter-bed has been formed. Flocculation not only binds the smaller with the larger particles into aggregates readily stopped by the fabric, so preventing its becoming choked by those of intermediate size, but enables the liquid to percolate more uniformly through the filter-bed and the speedier formation of a better-drained cake.

### The Blomco Thickener

The Blomco Type A thickener, is designed for the de-watering of thinner suspensions or effluents, with the production of perfectly clear filtrate and a sludge of any desired density, a usual for the latter being of the order of 60 per cent. dry solid content, or a still higher percentage for some materials: such a sludge will just flow down a launder with an inclination of 1 in 4. The Blomco Type B thickener deals with pulps carrying a higher ratio of solid, or sludge, from Type A. It yields a cake whose moisture content varies with the solid in question, but closely approaches or even equals that of good cakes from a filter press.

In the first type the filter elements take the form of vertical cylinders permanently submerged in the pulp and operated by suction: the cake which forms is periodically disrupted, released and falls, and is removed from the coned bottom of the tank, as sludge, by a suitable pump. In the second type thick pulp or sludge is de-watered upon a filter composed of segments, final drainage and removal of the cake taking place in air. In both, the essential feature is that filtration is effected upon a resilient medium, whose form and volume alter automatically with differences of pressure.

The construction and functions of this resilient filter system are illustrated in the following diagrams, Figs. 1 and 2, where the partial cross sections shown may represent either a portion of a vertical cylinder element of Type A or a segment of the Type B.

### Details of the System

In the diagrams (a) is the filter cloth, resting on (b), a layer of jute, burlap or other open fabric, serving as a drainage area for the filtrate passing through the cloth; (c) is the resilient support, capable of compression and recovery under alternation of pressure. This layer is borne upon the rigid framework (d), which is part of the closed chamber which receives the filtrate, through suitable drainage channels (f), and connects with the suction by which the filtrate is finally discharged. The resilient layer or member (c) is not necessarily permeable in itself; it may be constructed in various ways, but the preferred form is a layer of spongy rubber of suitable thickness.

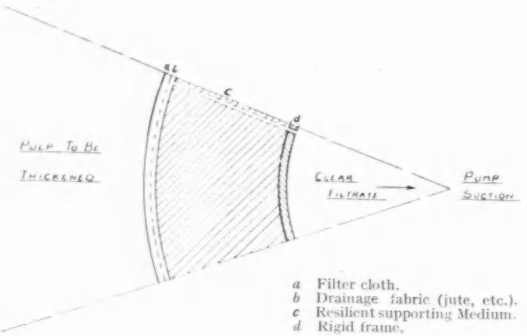
While the resilient layer remains at normal expansion, that is, when no difference of pressure exists between its outer and inner surfaces, the lightly-stretched filter cloth and its under layer of drainage fabric rest closely and evenly upon it, as in Fig. 1. When suction is applied, filtration commences; with deposition of the solid on the filter cloth an inward pressure is increasingly exerted and correspondingly compresses the resilient layer; compression continues until it reaches a maximum for the conditions, usually that of a vacuum of 25 to 28 in. of mercury. Since the filter cloth and drainage fabric can no longer conform uniformly with the lessened arc of the compressed resilient they tend to crease into small folds or corrugations, upon which the solid builds up; this "crimping" is shown, in somewhat exaggerated degree, in Fig. 2: the clear filtrate passes to the wet vacuum pump.

The cake of solid having attained sufficient thickness, when further accretion would unduly lessen the rate of filtration, a period of minutes previously determined by trial, for the

given pulp, the vacuum circuit is broken by the automatic valve mechanism and the pressures of the pulp and filtrate are temporarily equalised. The resilient layer immediately expands to its former volume, regaining its full outer arc and stretching the filter cloth and fabric to their original area and tension, as in Fig 2. The cake of solids is similarly expanded and split up; its contacts with the previous folds of the cloth being also sheared, it cracks and falls off.

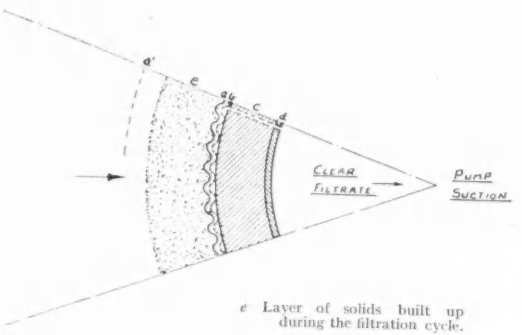
In type A the loosened cake drops cleanly from the cloth to the coned bottom of the tank, where it is cut up by a revolving blade and is removed, as sludge, by the variable stroke pump; the consistency of the withdrawn sludge is regulated, as required, by variation of pump stroke. The equating of pressure, cake removal and washing of the cloth occupy only a few seconds, after which the automatic valve, which times and operates the sequence, re-establishes suction and starts a fresh cycle.

In Type B the loosened air-drained cake is continuously lifted from the drum segments by an automatically adjusted roller.



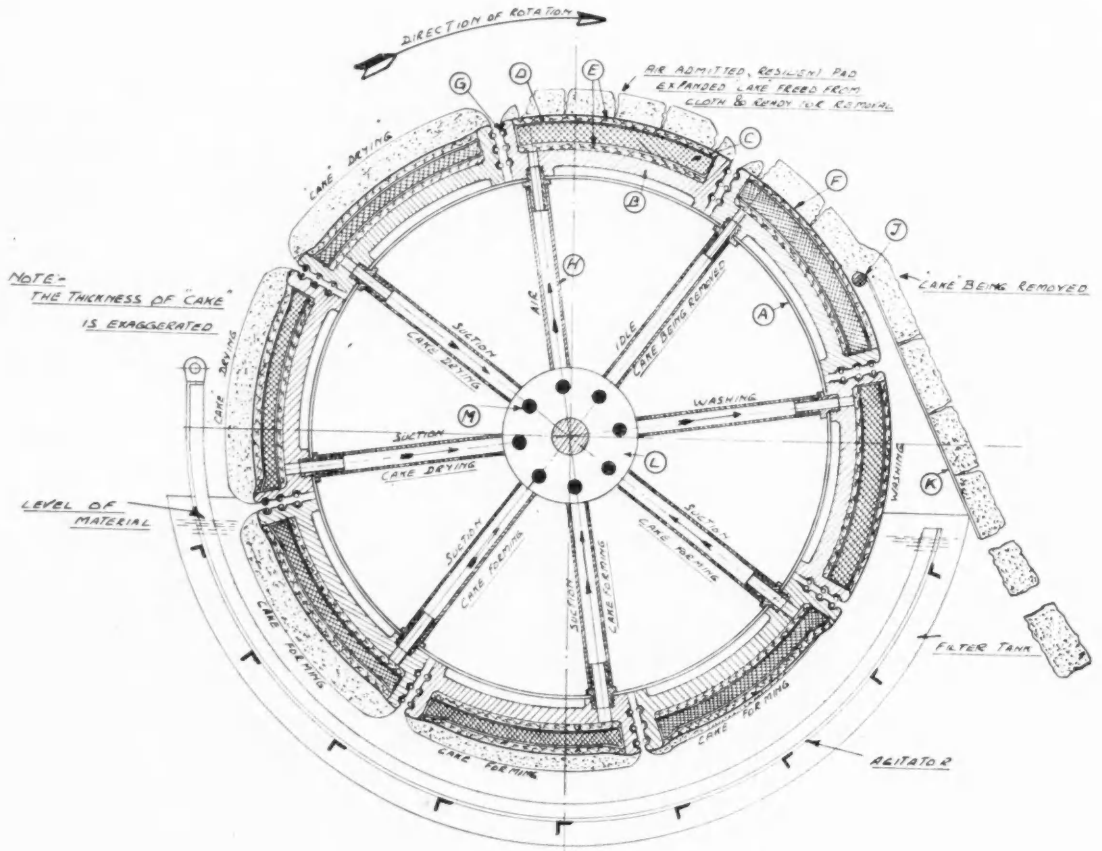

*a* Filter cloth.
*b* Drainage fabric (jute, etc.).
*c* Resilient supporting Medium.
*d* Rigid frame.

FIG. 1.




*e* Layer of solids built up during the filtration cycle.

FIG. 2.




A. Rim of drum carrying elements (spokes not shown).
B. Element castings.
C. Resilient pad.
D. Jute bag encasing resilient pad for portage purposes.
E. Cocoanut matting for portage purposes.
F. Filter cloth.
G. Wires holding filter cloth.
H. Flexible hoses to elements.
J. Cut-off roller.
K. Apron for cut-off.
L. Rotating part of valve.
M. Ports for valve.

FIG. 3.

**Sectional Arrangement showing the principle of the Blomco "B" type Thickener.**

Several important advantages accrue from this system: Due to its partial crimping during the pressure phase, the fabric presents a greater filtration area per unit of filter-bed surface; and by the crowding of its texture, offers greater hindrance to the passage of solids. Secondly, on equation of pressures the cloth regains its normal tension; its texture being again expanded, the back-flow of filtrate instantly washes it clean. Thirdly, as disruption and shearing of the cake from the cloth is effected solely by the resilience of the supporting medium, no compressed air or reversal of pressure is needed; the cloth in resting evenly upon its support is subjected to no strain at any point. The filter cloth is thus maintained at full efficiency and its working life almost indefinitely lengthened.

Blomco Type B thickener (Fig. 5), for the production of filter cake of minimum moisture content from thickened pulp or sludge, is of the revolving drum type. It differs fundamentally, however, from existing types of rotary filters not only in utilising the distinctive resilient filter system, but in its segmental construction. Each segment arc forming part of the peripheral filter surface is an independent element, closely occupying a recessed filtrate chamber, whose eduction pipe connects, by means of a central valve, with the wet vacuum pump.

The working of the Blomco thickener was demonstrated by an apparatus constructed in the meeting room, representing the Type A thickener. It dealt successfully with a mixture containing about 25 per cent. of solids, in the form of slate, very finely ground, to about 300 mesh. Dr. Cullen said that so far the plant was handling only moderate tonnages, such as that mentioned in the paper—a thickener of eight elements was separating from 25 to 30 tons of dry solids per 24 hours. He did not know whether it could be developed to deal with larger tonnages; one could add unit to unit, of course, but that had not been done so far.

## Points from the Discussion

Mr. FRANK YEATES referred to an article by Mr. D. Campbell MacKenzie, entitled "A New Thickener," published in "The Mining Magazine," May, 1933, describing the Blomco machine which appeared to be, in its main outlines, a copy of two thickeners already known—the Oliver-Borden and the Genter. Part of the description of the machine mentioned in that article was similar to the description of the plant in the present paper. The Genter machines had been known for more than 10 years, and there were about 80 in use in different countries, having a total filtering area of 72,000 sq. ft. It could be made in very large sizes, the largest size having 2,300 sq. ft. of filtering area in the elements. Two such machines were working at a Canadian coal mine, treating 1,000 tons per day of a material of which 90 per cent. was 325 mesh; they were reducing a pulp containing 9½ parts of water to 1 of solids to a sludge containing 65 per cent solids. That data might encourage the authors of the paper in the development of the Blomco machine.

The resilient medium which was the great novelty of the Blomco machine was ingenious, but Mr. Yeates asked if the kick-back (which occurred when the flow was reversed) was as effective as the usual blow-back of air on vacuum filters generally, and whether the medium was permanently resilient or whether it became fatigued. Inasmuch as it consisted of Sorbo rubber, it would appear that the medium would remain permanently resilient. In machines such as the Genter, the compressed air blown back forced back through the medium a little of the filtrate, so that the cake was washed from the element; it would be inefficient to remove it by air alone. The same principle was used in the Blomco machine. Compressed air was not always used to force the filtrate back. In the smaller sizes of Genter machine there was a hydrostatic head of filtrate, and he asked if this hydrostatic head was not almost analogous to the use of the resilient medium in the Blomco machine. Thickener filters occupied an intermediate position between straight thickeners and straight filters, and had limited use.

Mr. W. RUSSELL said he believed it was a general rule that it did not pay to filter a pulp where one could remove a solution by decantation; and further, that it did not pay to dry if one could remove the solution by filtration. However, there were exceptions. For instance, sometimes in batch processes, where the material to be handled came in irregularly, it did not pay to thicken; it was better to use a filter. Occasionally one had to deal with volatile liquids, where a decantation plant of any type would be out of place; in such cases a press would be used. From his 30 years' experience, however, he claimed that generally it was more economical, both in first cost and labour cost, to remove what one could remove by decantation, if the liquid were clear and if the solids settled well.

The data given in the paper were very scant. Everyone knew that the capacity of a machine for the filtration or thickening of particles of slate from liquids depended on the density of the feed. But there was no mention of feed density in the paper, and one would like to know the density of feed in cases where figures were given concerning the tonnages handled in stated periods. Again, one would like information concerning grading, because although the size of material referred to was 300 mesh, there was quite a difference between various 300-mesh pulps. Some kinds of slate were fairly granular, whereas others were slimy.

## A Sweeping Generalisation

Mr. R. F. STEWART, dealing with the more chemical aspects of the problem, said it was not correct to say that flocs settled at rates varying with their diameters in accordance with Stokes' law; this law assumed that the spheres were rigid, but these were not. It was also a sweeping generalisation to state that flocculation was always an advantage, because frequently thickening was not the final stage in a process but an intermediate stage, and flocculated material might not be desired. For instance, it was difficult, and in some cases impossible, to remove fine grit by wet classification from a strongly flocculated material. The thickening problem had, therefore, to be considered in conjunction with the other sections of the plant. No new principle of thickening or filtration was disclosed in the paper. The only novel feature was the special method of discharging the cake from the filter surfaces, which surfaces were arranged in very much the usual manner. The method described appeared to him to have no advantages over the methods at present in use, and there seemed to be several disadvantages. For instance, it was difficult to believe that a cake comparable with a filter press cake could be obtained; indeed, he would expect the cake to be rather wetter than could be obtained on a vacuum drum filter, because the back flush water would in most cases dilute the cake.

The filter sections, continued Mr. Stewart, should have drainage pipes on the leading edges as well as on the trailing edges; otherwise the liquor would get to the lower part of the chamber and would never be drawn out. As regards completeness of discharge of the cake, no doubt some thick cakes would detach easily and completely, but with the strongly flocculated materials which the authors aimed at obtaining as often as possible he could not believe that one movement of the filter medium would detach it completely. On the Dorrco filter the cloth was alternately expanded or bellied out and contracted sharply, and with many cakes about three good flaps were required to secure 100 per cent. discharge. Again, in chemical work it is frequently necessary to employ a woven wire cloth; apparently this could not be used on the Blomco machines.

## Treatment of Mud

Mr. G. W. HEWSON (London Power Co.) said the problem for his company had been accentuated when operations were commenced at the Battersea Power Station, by reason of the tremendous amount of mud coming down with the water of the Thames. He estimated that about 90 per cent. of the solid material they had to extract from the washing medium was Thames mud, which was of a very fine, colloidal nature, and no thickener or settling device could be built big enough to deal with it effectively. The mud which came from the rotary filter, and which contained about 60 per cent. of water, was such that it could be shovelled into a truck, and if left in the air it dried to a much lower water content; indeed, it almost reached a condition in which it could be crumbled.

Dr. CULLEN, replying to the discussion, emphasised that the novelty, if there were any novelty, was the resilient medium. He agreed with one or two of Mr. Russell's generalisations. Obviously, one must agree that if sedimentation could be made effective it was infinitely cheaper than any system of filtration or thickening; that was common sense. He also agreed that in the Blomco machine, when the cake was being formed, the cake itself became the filtering medium. That, also, was commonsense.

# Bleaching, Dyeing and Finishing—II

By A. J. Hall, B.Sc., F.I.C., F.T.I.

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At the present time dyers do not experience much difficulty in dyeing rayon goods evenly, for rayon manufacturers now appear to have overcome their earlier difficulty in producing rayon of uniform dyeing power. For this reason less attention during the past year has been paid to the so-called "even-dyeing" dyestuffs, except from a more academic viewpoint. But much new knowledge has been disclosed concerning the manner in which viscose rayon absorbs direct dyes. It is a striking fact that viscose rayon does not absorb such dyes as Chlorazol Sky Blue FF and Benzopurpurine 4B unless there is present in the dyebath at least a trace of an electrolyte, such as common salt. Thus, dyeing with chemically pure dye solutions would probably be an impossibility. S. M. Neale and his collaborators have published interesting papers on the preparation of pure direct dyes and their absorption by viscose rayon ("Trans. Faraday Soc.," 1933, *29*, 1167; *ibid.*, 1934, *30*, 368 and 3271; and "Amer. Dyestuff Rep.," 1934, *23*, 110). An important observation is that the even-dyeing power of a direct cotton dye is proportional to the rate at which it dyes the rayon.

A useful technique has been developed for estimating quantitatively the amount of direct dye present in dyed viscose rayon. It consists of steeping the rayon for a few hours (generally overnight) in a mixture of equal parts of water and pyridine at room temperature (occasionally the mixture requires warming to about 50° C.) until all the dye has been removed and then comparing the colour of the pyridine extract in a suitable colorimeter with a standard solution of the dye.

## Rayon Hose

Rayon continues to find an increasing use in the manufacture of woven and knitted goods and, in turn, this has brought many problems to the dyer and finisher. In the case of knitted materials there is an increasing tendency to secure special effects by knitting together mixtures of the various rayons with various grades of cotton (for example, mercerised and non-mercerised). The dyer has to exercise great ingenuity in order to secure the coloured effects required and particularly is this so with rayon hose. Unfortunately, rayon is not so durable as cotton so that in a rayon stocking it is necessary to make the tops, heels, toes and the sole of the foot with cotton or wool. These older fibres are able to withstand the great wear to which these parts of the stocking are exposed. In dyeing, it is necessary to use selected dyes and methods of dyeing so that the stocking appears uniformly coloured although the dyeing affinities of the various fibres usually differ greatly.

Within the past year a large number of new dyes for cellulose acetate rayon have been made available. All of these dyes are of the water-insoluble type and are therefore applied from aqueous dispersions. The new dyes are mainly improvements on the older ones as regards level dyeing, fastness to light and various influences, and also freedom from phototrophy. It is notable that with this progress it is now possible to avoid absolutely the use of bright yellow dyes which show phototrophy, whereas, formerly, some of the dyes being sold were slightly subject to this defect. Direct black dyes for acetate rayon are available, but they are mainly used only for shading purposes; such dyes are costly when used for the production of deep black shades. Acetate rayon is still thus almost always dyed black by means of dyes which require diazotising and developing on the fibre. Acetate, according to Brit. Pat. 404,327, an alternative method for producing blue to black colourings consists of impregnating the rayon with 4:4'-diaminodiphenylamine and beta-oxynaphthoic-2:5-dimethoxyanilide, then treating with nitrous acid, and hot soaping; in this process both components of the final dye pigment are applied at once instead of successively.

Turning our attention to the processing of cotton materials it cannot be said that striking discoveries have been made during the past year. There is no doubt that cotton is much stronger and more generally durable than any of the rayons now being manufactured and that for the production of strong goods cotton will be preferred. But for dress and decorative fabrics rayon is surely displacing cotton. Cotton has not lost its appeal because of its lack of lustre, for many rayon fabrics now being sold have less lustre than mercerised cotton and often no more than ordinary cotton. Rayon is preferred mainly on account of its good draping qualities and its silky soft handle.

At the present time there must literally be some thousands of products available for finishing textile materials. Most of them give satisfactory results according to the purpose and the material for which they are recommended. But it is all extremely perplexing to the fabric finisher, who finds it very difficult to compare and estimate the value of the numerous products which are offered to him.

The powerful emulsifying properties of the sulphonated fatty alcohols, coupled with their stability in hard water, has enabled these to be used to a large extent in the preparation of finishing and softening products. Many such products contain mineral and/or vegetable oils permanently emulsified, and some actually contain the fatty alcohols themselves. Furthermore, quite a number of unexpected emulsifying agents have been developed and these are all being steadily investigated with a view to using them in the textile industry: among these may be mentioned lecithin and glycol distearate. By means of these products it is possible to improve the handle of cotton goods tremendously but it must be remembered that this improvement usually disappears with the first wash. Papers worth consulting by those interested in this phase of textile activity have been published by O. Mecheels ("Texilber.," 1934, *15*, 347), C. Dunbar ("J. Soc. Dyers Col.," 1934, *50*, 312), Munch ("Textilber," 1934, *15*, 557) and H. L. Jones and J. E. Smith ("Amer. Dyestuff Rep.," 1934, *23*, 424). It must not be considered, however, that the older softening agent, Turkey red oil, is likely to be completely neglected in favour of these newer products. A. R. Macormac ("Amer. Dyestuff Rep.," 1934, *23*, 406) has summarised information on sulphonated castor oil products.

## Crease-Resisting Textiles

The past year has not witnessed any substantial increased interest in crease-resisting cotton and no methods alternative to those originally patented by Messrs. Tootal Broadhurst Lee and Co. some two years ago have been disclosed. The investigations leading up to the important discovery of rendering cotton goods non-creasable have been described by Sir Kenneth Lee ("Nature," 1934, *133*, 316). It is interesting to note that electrical heating methods are employed on the large scale for heating the fabric so that the substances within it may be suitably polymerised into insoluble elastic resins.

Increased attention has been paid to the production of non-shrinkable fabrics, particularly those consisting of cotton. The Rigmel process of the B.D.A. is mainly used in this country (the Sanforising process is used in America for the same purpose) and the British Launderers' Research Association has standardised tests for non-shrinkable fabrics so that they can be suitably branded if they comply with these tests.

Some very useful researches have been carried out on the removal of cotton and cellulosic impurities from wool materials by the well-known carbonising process. It is difficult to summarise here the results obtained, and reference should be made to the original papers (M. Harris, "Bureau of Standards J. Research," 1934, *12*, 475, and B. A. Ryberg, "Amer. Dyestuff Rep.," 1934, *23*, 230). Improved methods for partially acetylating cotton for the purpose of increasing its resistance to mildew have been protected and this subject has been well reviewed by Thom, Humfield and Holman ("Amer. Dyestuff Rep.," 1934, *23*, 582).

Reference should be made to the recently published fastness tests (light, washing and perspiration) of the Fastness Committee of the Society of Dyers and Colourists. These tests are to be found in a special booklet published by the Society and they represent the most serious contribution so far made by British colourists towards the foundation of international standard tests of the fastness of dyed textile materials.

# Processing Plant in the Food Industry

**By P. A. Farmer, M.Sc., D.I.C., A.I.C.**

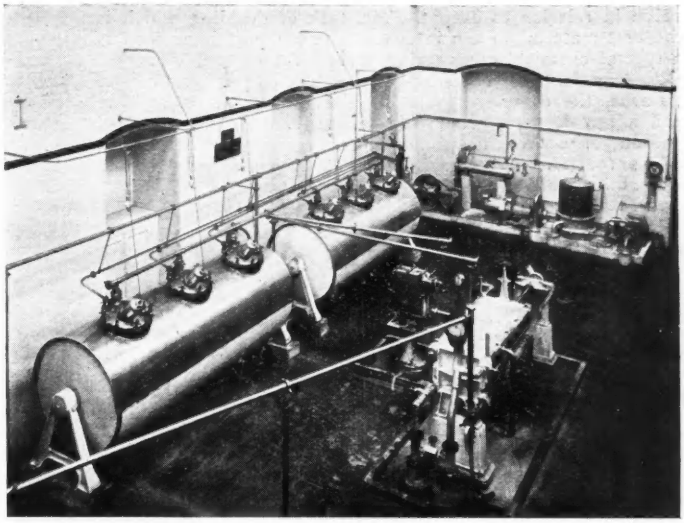

**Fig. 1—Vacuum Processing Plant, employed in the Dairy Industry, with a capacity of 1,500 gal. per hour.**

ONE of the most striking features of modern life has been the great decline in the individual preparation of food in a palatable form with the consequent rise and growth of a number of specialist firms engaged in the processing of a large variety of foodstuffs. Coincident with this change has come a growing realisation that if factory-produced food is to form a satisfactory substitute, a very high standard must be aimed at and due consideration given to such factors as the quality of the raw materials, correct mode of preparation, bacteriological condition, physical and chemical changes involved, and the cleanliness of the process.

## Selection of the Plant

The selection of processing plant for any particular food industry involves the consideration of a number of important factors which include size and complexity of plant unit in relation to output, corrosion, method of construction, length of life in regard to initial cost and scrap value of material, simplicity of control, ease of repair, and whether the operation is continuous or intermittent.

Once a process has become a commercial possibility, the first consideration is the selection of materials for constructing the plant, particularly that part which makes contact with the food products. The problem of corrosion, the possible formation of poisonous salts, the question of catalysis arising from the presence of finely divided metal abraded from the plant, undesirable effects such as coloration, unpleasant flavour or reduced keeping quality must be eliminated or reduced to negligible proportions. With such an extensive range of single metals and alloys as obtains to-day there are few processes in which one is limited to a single material of construction, and wherever there is a choice of suitable materials, it becomes a matter of balancing the factors of initial outlay, cost of construction, length of life and scrap

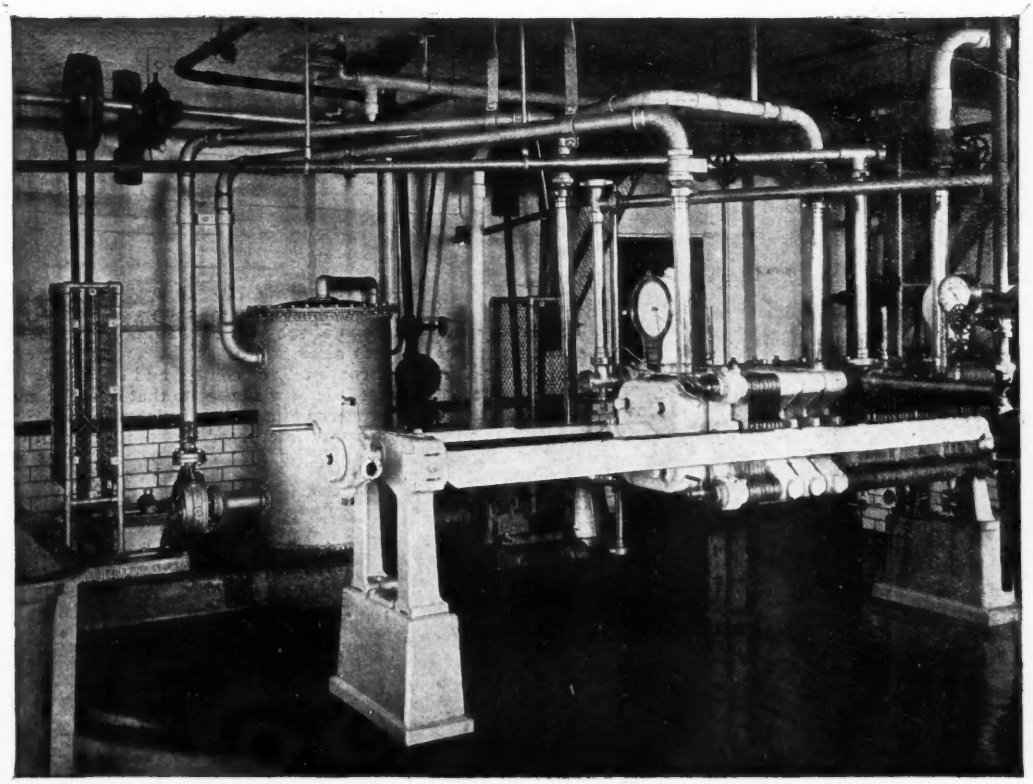

**Fig. 2—A. P. V. Milk Pasteurising Machines operating on the High-Temperature Short-Time System; capacity, 1,000 gal. per hour.**

value in relation to output. The task of deciding which is the best material to use in contact with a particular food is a typical chemical engineering problem.

Among materials containing more than 99 per cent. of one element, the commonest are aluminium, copper and nickel and a few forms of iron; of the alloys, there are stainless and Staybrite steels, monel metal, cupro-nickel and aluminium alloys (particularly Alpax); plated surfaces include tinned iron and nickel; and there are also glass and enamel linings, metal-lined wood and rubber.

Iron is very liable to rust and cause discoloration of food, hence it is not used where it is likely to come in contact with food products. Copper, a metal with good heat conductivity and working qualities, is still extensively used, mainly in the brewing industry, but caution is needed in its use as its salts are poisonous. Nickel is harmless to the human system; it is tough and durable but costly, yet for certain purposes its use is desirable, as in preparing pickles, sauces or where an alkaline reaction may be expected. Aluminium is one of the best metals for many food processes; it is non-poisonous, practically unaffected by a large number of foods, is light in weight and reasonably cheap and easy to work. Of the alloys, the stainless and Staybrite steels are the most important; they are tough, non-rusting, susceptible of the highest polish, and capable of wide application. Monel metal is another useful alloy and this can frequently be used where stainless or Staybrite steel is undesirable; it contains copper and nickel, hence its use is prohibited where solution is likely to occur. Aluminium bronze and aluminium silicon (Alpax) are also used for food plant. The latter is superior in strength to aluminium, forms better castings and has extensive applications.

Glass and enamel linings, though hygienic and highly suited to many food processes, are costly and very sensitive to heat and mechanical shock. Wood by itself is difficult to clean and sterilise, but wooden vats and other vessels are frequently lined with welded metal sheets as an alternative to complete replacement.

## Fabrication of Plant by Welding

Probably no other method of construction has done so much to lessen the cost and improve the efficiency of food-processing plant as welding and probably no other process has received so much attention of recent years. Riveted joints, seams and inaccessible spots which harbour bacteria and foodstuffs liable to ferment, or go bad and spoil the next batch, are always a source of trouble. There are two ways of eliminating joints: one is to make castings and machine or grind to shape, a costly method especially for large work of non-standard design; the other is to build up the plant from separate sheets or parts by welding, followed by grinding and polishing if necessary.

A satisfactory weld is one which is as near homogeneous and as free from internal strains as possible and which does not change in composition or set up local corrosion. Welded plant, especially when made of newly-introduced alloys, has given some disappointing results in the past, due chiefly to an imperfect understanding of the crystalline changes which occur and to lack of final heat treatment, or lack of training of the operator. The intensive study by the metallurgist of the behaviour of metals and alloys during heating and cooling and of the changes liable to occur during welding has completely altered this aspect and welding of many kinds of metals and alloys is now the continuous work of the higher grades of coppersmith. In certain cases where it was impossible to produce satisfactory results without final heat treatment, this is now obviated by the introduction of new alloys. Staybrite F.D.P. steel is a case in point; it is claimed by the makers that this steel can be used for fabricated and welded work without final heat treatment and that disintegration of structure at heavily manipulated points is completely prevented.

## The Dairy Industry

Many types of plant can also be constructed from welded sheet aluminium, copper, nickel, etc., and it is quite a feasible proposition these days for bulky plant to be made in sections, transported to the factory and finish welded *in situ*.

Few industries have undergone such a radical change as the dairy industry. Little more than ten years ago it consisted of a few firms of medium size with a large number of smaller ones. Much of the milk was not pasteurised; it was collected and sent from the country in churns and delivered to the consumer in open vessels. Frequently in hot weather it was sour by the time it was received by the retailer. Where pasteurisation was employed the necessary equipment had to be imported from Denmark or the United States, but dairy machinery of all kinds is now made in England, and from being an importer England has become an exporter of this class of machinery, even to those countries from which such machinery was formerly imported.

## Two Systems of Pasteurisation

Two systems of pasteurisation are in use to-day: the high-temperature short-time process and the continuous-holding process. In the former the milk is heated to 160° to 162° F., maintained at this temperature for 15 to 30 seconds and quickly cooled; by this means the bulk of the undesirable organisms are killed, the keeping quality improved, and the nutritional properties, flavour and cream line unimpaired. In practice careful control of time and temperature are needed to maintain a good cream line as the system operates within very narrow limits. It is doubtful if this system can give wholly consistent results unless exceptional facilities are provided for bulking the milk both before and after treatment. Although milk treated in this way is of the same quality as that produced by the second method, it cannot be sold as "pasteurised" because the conditions of treatment do not comply with the official regulations. A general arrangement of a plant for this system is seen in Fig. 2.

The second method is the one most widely adopted by dairies both large and small, not only in England but in many countries abroad, particularly the United States and Canada. It has the advantage that it complies with the legal requirements of pasteurisation, hence milk so treated can be sold as "pasteurised." The essential parts of the system are the filter, the heat exchanger and particularly the holder retarder; the flow of milk on the inlet side of the system is maintained by pressure and on the outlet side by vacuum—the Shepherd process—and from the time the milk leaves the tank wagon till it enters the bottles, it never comes in contact with atmosphere. The milk is heated to 145° to 150° F., held at this temperature in the retarder for 30 minutes and then cooled. Fig. 1 shows the layout of a plant operating on this system. In place of the pressure-vacuum system, smaller dairies often use a Tarbet positive holder, Fig 4. The milk on leaving the heat exchanger next passes to the holder which is divided into six compartments and rotates once in 45 minutes, each division taking 30 minutes to pass between the points of filling and emptying. Discharge takes place through a trip valve into a balance tank.

Machinery plays a large part in maintaining the efficiency of the modern dairy, the most important in this respect being the continuous filter, the heat exchanger and the bottle washer. The continuous filter is a combination of two filters in one machine, with a simple device for changing the flow of liquid from one filter to the other so that a fresh filter cloth can be fitted without interrupting the process or wasting liquid. It can be used to clarify other liquids besides milk.

## The Heat Exchanger

The heat exchanger, one of the neatest examples of modern processing plant, utilises almost ideal conditions of heat exchange, variability and continuity of control and simplicity in cleaning. In appearance it is very similar to that of the frame type of filter press and consists of a series of plates having zig-zag grooves on both sides and, interposed between each pair of these plates, a thin plate. The plates are assembled as in a filter press, a liquid-tight joint being effected by a beading of rubber or soft aluminium wire let into a channel running round the edge of the plate. To take care of expansion and to ensure correct tension the connection between the end plate and the screw is by means of four strong springs mounted on guide rods and contained in a box attached to the end plate. In operation one liquid to be heated flows through every other series of grooves and the liquid to be cooled through alternate series of grooves in the opposite direction.

The modern heat exchanger has a number of advantages, including its adaptability as a heater or cooler of fluids and as a regenerative heat exchanger—as is done in pasteurising milk. The latest type of machine is a very compact one occupying a floor space of 5½ square feet, with stainless steel

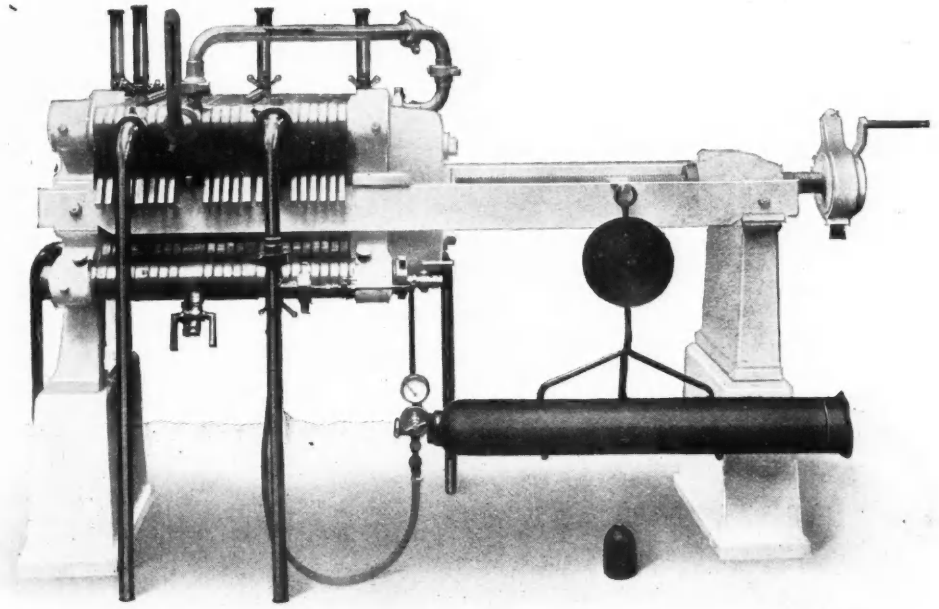

**Fig. 3—Stout Pasteurisation and Carbonating Machine.**

plates and a capacity of 1,200 gallons of milk per hour. This machine is fitted with an hydraulic opening and closing device.

The bottle-washing machine is a typical example of the modern type of machine that is being introduced into all industries. The ultra-modern washer is continuous and automatic. The pre-rinse and caustic soda flushings are followed by hot, warm and cold water rinsings, both external and internal, all great in volume and at pressures varying from 10 to 25 lb. per square inch. Each bottle may occupy 20 to 45 minutes for cleaning and the total volume of rinses may be as great as 20 gallons per bottle—but all with extreme economy in water and heat.

During the past few years various attempts have been made to eliminate glass bottles and to substitute waxed cartons, which after use are discarded. The early efforts were only a partial success owing to mechanical difficulties in sealing the cartons. Latterly the machines used for this purpose have been improved and milk can be bought in cartons in certain parts of the country.

## The Brewing Industry

The principal changes in brewing have been in the increasing use of new metals or alloys for constructional purposes, better methods of cooling and pasteurising, and the greater use of machinery for bottling.

During fermentation, which commences at 60° F. the temperature rises considerably and has to be controlled by pass-

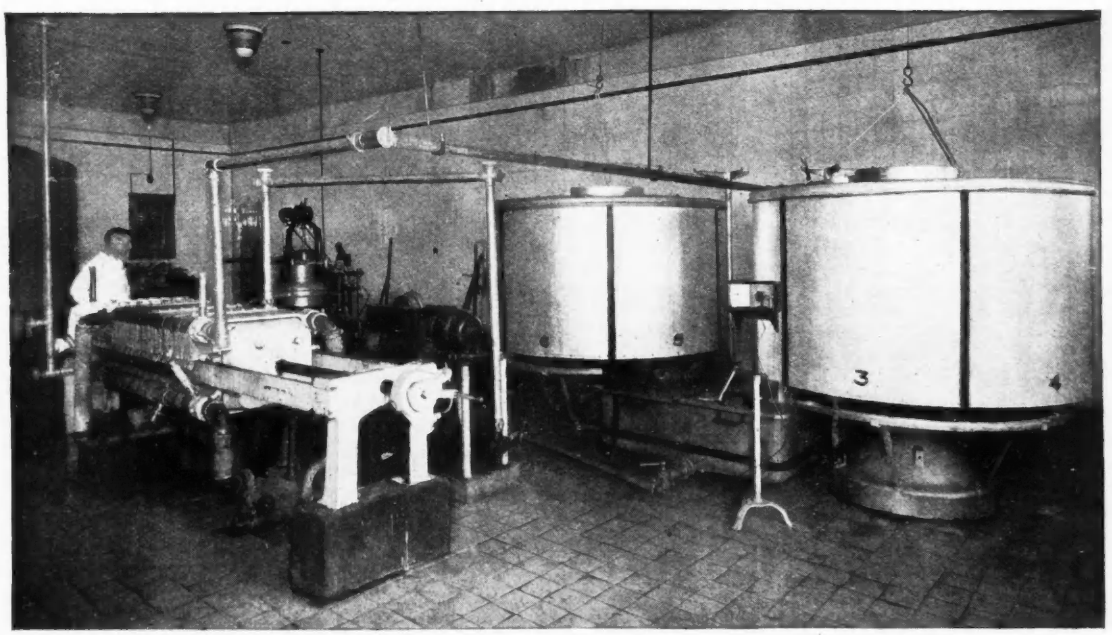


**Fig. 4—Part of a Tarbet Holder for the pasteurisation of milk in Amsterdam.**

ing cooling water through coils inside the vessels. The process lasts 60 to 90 hours, according as the fermentation is fast or slow, and towards the end the yeast rises to the top, passing through sluices into yeast backs, or in the latest practice collected by vacuum-suction nozzles, discharged into hermetically sealed aluminium vessels, and thence forced by compressed air through special filter presses of readily sterilisable construction. It is usual for part of these presses to be arranged for contnuous brine chilling so that yeast can be stored therein in readiness for the next batch of fermentations.

The wort, which is now converted to beer, is transferred by detachable—and easily cleanable—pipes to the casking or bottling room. It is desirable to have this part of the plant so designed that it can be kept in an aseptic condition, particularly with modern beers of low alcoholic strength, for, generally speaking, the higher the alcoholic strength the more self-preservative is the liquor.

### Conditioning of Beer

Before bottling, beer is usually filtered in a frame type of press, after careful and prolonged conditioning in bulk and storing at low temperature, and may be pasteurised in a heat exchanger using the regenerative system. For pasteurising, the beer is heated quickly to 145° F., held long enough to kill the yeast cells and bacteria and rapidly cooled. One useful modification is the simultaneous carbonating of the beer (or stout) with $CO_2$ gas in the same machine, the gas being injected at the hottest point and the weight of gas used per unit volume of beer indicated directly by means of a spring balance to which the gas cylinder is attached. Fig. 3 illustrates a 10-barrel per hour stout pasteurising and carbonating machine.

A considerable number of breweries are now successfully pasteurising stout (and to a lesser degree beer) in bulk prior to bottling, but success in this direction depends entirely on being able to maintain the bottle-filling plant in sterile condition as after infection during the process of bottling is difficult to avoid. Cases are known, however, where, under carefully controlled conditions, beers pasteurised in bulk and then bottled have remained in a sterile and bright condition for many mouths, including transport to and storage in tropical countries.

The bottling of beer is done in machines generally similar to those used at dairies, but adapted for working on a counter-pressure system to avoid loss of carbon dioxide. Any extra carbon dioxide required in the finished beer is made up by gas which has been collected from the tops of the fermenters and afterwards compressed. For washing bottles and casks, special machinery is employed, steam being used to sterilise the inside of the containers. The brewer's worst enemy is infection, and as all operations are intermittent it is difficult to avoid air-borne infection of plant or product. Consequently the aim of the designer is to consider, down to the smallest detail, how he can arrange for ready cleaning and for the maintenance of the plant in an aseptic condition.

### Vegetable and Fruit Canning

In canning, peas present the most trouble. When they have attained the required size, the vines are plucked up whole, conveyed to the cannery and passed into a revolving cage with perforated sides in which the peas are shelled. The vines pass out at the other end, while the peas fall through on to a travelling belt, inclined at such an angle that the peas roll down leaving the debris to be carried away. The peas are graded and then blanched, *i.e.*, immersed in hot water for a few minutes, which cleans and sterilises them, permits of closer packing in the cans and removes a gummy substance adhering to the surface of the peas. Next they move to a machine which automatically weighs them into cans, adds hot water containing a little salt, sugar and colouring matter and finally seals the cans. The cans are packed into a frame and lowered or run into an autoclave which may be as large as 20 ft. by 12 ft. by 15 ft. and heated for about two hours at 212° F. Other vegetables, and also fruits, are treated in a similar manner except that other methods of cleaning are required and blanching is not always resorted to. A syrup is employed for fruit, and the processing time is approximately ½ hour.

For pulped fruits, the fruit is first boiled for about 20 minutes, passed through a pulping machine and canned in the usual manner. The sieving and pulping machine, for which stainless steel is often employed, can also be used for "brushing" sauces and "sieving" vegetables.

### Jams and Preserves

In the preparation of jams and other preserves, steam-jacketed pans are used, the pans being made of aluminium, or silver-plated copper. They may be of the tilting or non-tilting type, with a sluice valve in the bottom. In some cases, such as in certain orange products, the peels, etc., are treated by a process differing from that used with the pulp, so as to obtain certain results. Blenders and mixers are made in a variety of designs with horizontal or vertical revolving blades and tilting or non-tilting pans, and are often arranged for steam heating. The containers can be made of aluminium, copper, monel metal, etc. For cooling jams and other products a satisfactory solution is obtained by using a cooler in which the material to be colled is fed in a continuous stream through the inside of a slowly revolving, stainless steel cylinder, on the outside of which water is sprayed. Strawberry jam can be cooled to 160° F. in this machine without unequal distribution of the fruit.

The progress of the dairy, brewing and preserving industries is characteristic of the food industry as a whole and it may be assumed that both processing and plant design will steadily improve and be recognised as a branch of chemical engineering.

The writer wishes to thank the Aluminium Plant and Vessel Co., Ltd., for the use of certain material and the blocks used for the purposes of illustration.

## Personal Notes

MR. P. J. GRATWICK and M. J. E. PEDDER have been appointed directors of Courtaulds, Ltd., as from January 1.

MR. ALBERT HITTINGER, general manager of the National Benzol Co., Ltd., has been appointed a director of the company.

MR. HENRY GILMAN, late of Joseph Gilman and Son, Ltd., of Birmingham, died on December 23. The business will be carried on by Mr. J. J. Cope, who has been a joint managing director of the company for many years, and Mr. Sherratt Gilman.

SIR ARTHUR SCHUSTER, F.R.S., of Yeldall, Wargrave, Berks, the famous scientist, hon. professor of physics at Manchester University, and chairman of the executive committee of the National Physical Laboratory, 1920-5, left estate of the gross value of £284,513

MR. JOHN T. WATTS, of Loughborough College, has been appointed assistant lecturer in the School of Chemistry at Robert Gordon's College, Aberdeen, in succession to Dr. John B. Coppock, who has received an appointment at Battersea Polytechnic, London.

MR. WILLIAM MUTTON, shipping manager for the firm of English Clays, Lovering, Pochin and Co., Ltd., died at his home on December 26, aged 62. Mr. Mutton had been since his boyhood in the service of John Lovering and Co., and in recent years had worked in close co-operation with Colonel W. T. Lovering as works manager.

MR. CHARLES HENRY RIDSDALE, director and metallurgical consultant, of Ridsdale and Co., analytical chemists, Middlesbrough, died on December 29, aged 73. A Fellow of the Institute of Chemistry and a member of the Chemical Society, Mr. Ridsdale shared in the experiments which lead to the development of the basic Bessemer process of steel manufacture.

FOR the quarter ending September 30, 1934, the production of soda ash by South African Alkali, Ltd., amounted to 660 tons, and the sales of soda ash to 683 tons. This shows a decrease of 75 tons and 88 tons respectively, compared with the previous quarter. In the year ending June 30, 1934, this company earned a gross profit of £12,527, of which £7,312 was paid out in dividends. During the year the supply of brine was not enough to maintain production at full capacity, so that it was necessary to supply the deficiency by working the trona deposits. The sodium carbonate had an average content of about four per cent. per fall.

# Chemistry in Agriculture in 1934

**By H. J. Page, B.Sc., F.I.C.**
**(I.C.I. Agricultural Research Station, Jealotts Hill)**

SO far as the chief crops of this country, and of the temperate zone generally, are concerned, the main manurial requirements under varying soil and climatic conditions are now reasonably well established, but there still remain many points of real economic importance to be elucidated. An example of this is the movement which has developed recently in the fertiliser industry of the United States for the use of "non-acid-forming" fertilisers. This has arisen from the well-known property of ammonium salts—which, in the form of sulphate, nitrate or phosphate, represent the greater part of the nitrogen used in fertilisers—of causing the loss of lime from the soil and then tending to make the soil acid. On soils with small or no reserves of lime this may induce a harmful degree of soil acidity. The normal method of preventing this is by the use of occasional dressings of lime or chalk. The alternative which is now being advocated in the United States is to incorporate in mixed fertilisers a sufficient proportion of limestone, as a filler, to counteract this decalcifying property of the ammonium salts therein. By using dolomitic limestone, which reacts much more slowly than ordinary limestone, with acid phosphate (as, for example, the monocalcic phosphate in superphosphate) serious "reversion" of the latter is avoided.

## Non-Acid-Forming Fertilisers

This movement is not likely to make much progress in this country. In the United States a high proportion of the cultivated soils in the main fertiliser-consuming belts are very poorly supplied with natural reserves of lime and are, on the whole, dangerously near to the borderline of acidity harmful to crops. Under these circumstances the "non-acid-forming" fertiliser movement may well have a real practical justification. In this country, on the other hand, while it is certainly true that acid, lime-deficient soils do occur in some districts, these are, on the whole, of minor occurrence, the bulk of the cultivated soils being supplied with good, natural reserves of lime, such that ammonium salts could be applied to them, without liming, for very many years, before those reserves would become seriously depleted. Farmers, on the whole, are well aware of the need to lime their land if it is becoming lime-deficient; though they cannot always afford to do so, an indication of the lack of interest, even in inexpensive liming, in many arable districts, is afforded by the fact that waste carbonate of lime from beet sugar factories—a highly effective neutralising dressing for sour soils—which can usually be had for little more than the cost of carting, is in little demand even among farmers near at hand, and often becomes a serious embarrassment to the factories.

The above remarks refer more particularly to the arable districts on which most of the compound fertilisers are used. There are extensive areas of poor acid grassland, particularly in the north, which are crying out for dressings of lime, but in these cases really heavy dressings of the order of a ton or so per acre are needed. Moreover, much of the nitrogen used on grassland is applied separately from, not along with, the phosphates and potash, and for such cases, where a non-acid-forming nitrogenous fertiliser is needed, this is available in an excellent form as nitro-chalk, a mixture of ammonium nitrate with enough calcium carbonate to give it a neutral reaction in the soil.

## Concentrated Complete Fertilisers

The concentrated complete fertilisers ("CCF's") which since their introduction only a few years ago have achieved such a good footing in the fertiliser practice of this country, illustrate another aspect of the lesser practical importance of the supply of calcium in compound fertiliser in this country in comparison with, for instance, the United States. Such fertilisers, which contain their $P_2O_5$ in the form of ammonium phosphate, are devoid of calcium, whereas the lower grade compound fertilisers contain a good proportion of calcium in the form of superphosphate. This absence of calcium from concentrated fertilisers based on ammonium phosphate has been responsible for unsatisfactory results on some of the light lime-deficient soils of the United States, notably in the cotton belt. In this country, on the other hand, extensive comparisons, which have been reported on by Lewis during the past year, have demonstrated that CCF's are just as effective as ordinary compounds of equivalent plant-food content on practically all types of soil.

Attention has also been directed recently to the possible importance of sulphates as constituents of fertilisers on some soils, with the implication that superphosphate, with its high content of calcium sulphate, might be superior to ammonium phosphate. Although a striking instance of sulphur deficiency in the soil has recently been brought to light in East Africa, where it is responsible for a nutritional disease of tea known as "tea yellows," which can be cured by the application of sulphates, no instances of sulphate deficiency are known in the soils of this country. Even if they were, the use of concentrated fertilisers based on ammonium phosphate would not involve any inferiority on that score to mixtures containing superphosphate, because in such concentrated fertilisers of British manufacture the mono-ammonium phosphate is mixed with appreciable proportions of ammonium sulphate to get a suitable balance of nitrogen and phosphate.

## Minor Elements in Fertiliser Practice

It is but a short step from this to the question of the possible importance of the so-called "minor" elements in fertiliser practice. Although a fair number of elements other than the nitrogen, phosphorus and potassium commonly supplied by fertilisers, are known to be needed by plants, it has hitherto been thought that the less common nutritive elements which may be absent from fertilisers are present in soils in sufficient amount to satisfy the needs of crops. There is no doubt that this is generally true, but in recent years cases have come to light, in isolated districts, in which crop production has been seriously limited for lack of available traces of some minor element in the soil. One of the most spectacular instances of this is in the Everglades of Florida where on certain soils it is impossible to obtain proper crops unless, in addition to the so-called "complete" fertilisers, dressings of a copper salt are also given. In other cases, on the Continent as well as elsewhere, manganese may be similarly lacking. Hitherto, such questions have been of little more than academic interest to the fertiliser practician in this country, but in recent years similar cases have begun to come to light here. A malady of oats has been found in certain restricted areas, which can be cured by small dressings of manganese sulphate. More recently, this year, in fact, a disease of sugar belt, known as crown rot, has assumed serious dimensions in Ireland. This disease is already well known on the Continent and there is much evidence to indicate that it is related to a lack of available boron in the soil. This view has been strongly supported by results in Ireland, where complete cure of the disease has been achieved by the application of small dressings of borax. Whilst such instances will no doubt remain the exception rather than the rule, it may well be that they will assume sufficient importance to make it necessary for fertiliser manufacturers to be prepared to supply special fertilisers containing suitable proportions of manganese, boron or other "minor" elements for use in such cases.

## Excess of Lime

It is noteworthy, as illustrating the other side of the liming story—that is to say the dangers of too much rather than too little lime in the soil—that both the above-mentioned maladies, of oats due to lack of manganese and of beet due to lack of boron, are specially associated with soils containing excess of lime.

Before leaving the subject of fertilisers mention should be made of the striking rehabilitation of the citric solubility test of basic slag as a result of recent work by Crowther at Rothamsted. Another case in which recent work suggests possible developments in manuring practice is illustrated by the interesting work of Roach, at East Malling, on the injection of chemicals into fruit trees. Another direction in

which chemicals are finding increased use in agriculture is in weed eradication. Annual weeds, notably charlock or wild mustard, cause serious losses of yield of cereal crops in this country. The problem is to employ some chemical treatment which will destroy the weed in the young corn without damaging the crop. Some years ago Raboté showed, in France, that this could be done very effectively by spraying with dilute sulphuric acid. Following work at Oxford by Blackman and at Jealotts Hill, this method has been used extensively in this country during the past year, under the auspices of Imperial Chemical Industries, Ltd., and of the National Sulphuric Acid Association. Several thousand acres of corn were sprayed at a cost to the farmer of only about 12s. 6d. to 15s. per acre, and there are many well-attested results to show that such spraying often resulted in doubling or more than doubling the crop, with a return far in excess of the cost of spraying.

### Eradication of Perennial Weeds

For the eradication of perennial weeds, particularly of the deep-rooted kind, sodium chlorate is becoming a well-established material. Its high cost prevents its more general use but considerable quantities are being used in New Zealand for the eradication of ragwort—a serious weed of grassland there. Although free from the obvious objections of poisonous arsenical weed killers, the fire risk associated with its use is a matter of some concern. There have been some serious accidents in New Zealand, though some had their comic side, as in the case of the farm worker who, having got his trousers soaked in chlorate solution, had the alarming experience on drying himself in front of the fire of being violently and explosively "debagged." An active search for a less hazardous but equally effective substitute is in progress, but so far nothing approaching chlorate in effectiveness has been found.

The conservation of grass and other green fodder crops is a subject which is much to the fore as a means of making the farmer less dependent on purchased imported oil cakes and the like for the winter feeding of his stock. Here again chemicals may play their part, for, by the modified ensilage process known as the A.I.V. fodder process, introduced from Finland where it was worked out by A. I. Virtanen, a solution of hydrochloric and sulphuric acids is used to suppress fermentation and loss in the silo. Much critical work on this process is being done by Watson at, and in conjunction with, Jealotts Hill, but no final pronouncement has yet been made as to its economic advantage over other methods of ensilage not involving the use of acids, under British conditions. Reference to this subject would be seriously incomplete without mention of the alternative, and in many ways more attractive, method of conservation by artificial drying. This subject has now passed out of the experimental stage, since it has been shown at Jealotts Hill that dried grass can be made on the farm scale without loss of nutritive value and that it enables the dairy farmer, for instance, to produce, in winter, milk and butter of summer colour and quality. The process is now in course of practical development as an economic and engineering proposition, by Imperial Chemical Industries and by other firms, and there are good grounds for believing that before long the farmer will be able not merely to buy dried grass or other dried fodder crops, such as lucerne, but that he will be able to install a plant on his own farm to dry the produce of his own meadows and pastures.

### Pest-Control Chemicals

Only brief reference is possible to the fields of pest-control chemicals—insecticides, fungicides, etc.—which offer such an important and potentially enormous outlet for chemicals of various kinds. A big step forward has been taken by the Association of British Insecticide Manufacturers, at the invitation of the Ministry of Agriculture and in consultation with the National Farmers Union, in drawing up standard specifications for the more important pest-control preparations. The holding of the International Locust Conference in this country during the past year has focussed attention on a big field for the development of chemical methods of pest control. The use of dust clouds of sodium arsenite discharged from aeroplanes is being tried with prospects of successful development in Africa. The recent appearance of eelworm disease of sugar beet in this country, and the ever-present danger of the arrival of the Colorado potato beetle from France, indicate other directions in which chemical insecticides are likely to become urgent needs in the future.

Reference must be made to the recently published report of the Agricultural Research Council, which was set up in 1931 by the Committee of the Privy Council for the organisation and development of agricultural research. This report gives an excellent and very readable account of the position of all branches of agricultural research in this country up to September, 1933. The following extract from its conclusions is specially noteworthy:—"Not only are the sciences concerned in agriculture developing rapidly and continually adding to agricultural knowledge, but the art of practical farming . . . is changing almost equally fast. The idea that success in farming depends on long experience handed on from generation to generation can be shown to be erroneous. In the survey of East Anglian farms, carried out by the Economic Branch of the Cambridge School of Agriculture, an inquiry is described . . . wherein farmers occupying over 100 farms were arranged in age groups. An inverse correlation was found to exist between age and success as measured by profit and loss. The younger the age-group the higher were the average profits; the older the farmers the greater the average losses they sustained. . . . The lesson seems clear. Agriculture is now changing so fast that experience of past methods is less useful than knowledge of new ones and the mental adaptability and courage necessary to try them. This result alone goes a long way to justify expenditure on agricultural education and research."

## Letters to the Editor

### Low Temperature Carbonisation

SIR,—Snobs are humble folk or they would not be snobs; and perhaps the humility of the English when they find a foreigner doing something which they are doing equally well themselves is just a variant of snobbery.

We are gravely informed in the report of a recent action, that an Italian, at the behest of Signor Mussolini, had got to the point, in 1930, of "turning coal into semi-coke by low temperature carbonisation." But why the solemn announcement? In 1930 over one million tons of "semi-coke" (or coalite) had already been produced by native-born Englishmen.

Had they only thought about it sooner they might have anticipated the recent jest of Sir Henry Wood (the famous musical composer) and done their job under some highfalutin Russian name.—Yours faithfully,

D. HOPE JOHNSTON.

1a Regents Court, Hanover Gate, N.W.1.

### British Industries Fair

SIR,—A question is being asked as to when the British Industries Fair reaches its majority, or in other words comes of age? It recalls to my mind a question which was hotly debated in 1900, as to whether this year was the first year of the 20th century or whether 1901 would be able to claim that distinction. The first Fair, a war "show" of goods, until then made abroad, was opened at the Royal Agricultural Hall in 1915, so the one which begins in London on February 18 is the 21st to be held. Is the Fair twenty-one years of age then? The opinion of your readers, particularly those among them who were born in 1915, would be particularly interesting.—Yours faithfully,

J. P. BACON PHILLIPS.

Burgess Hill, Sussex.

### Recovery of Scrap Tin in Germany

IT has been estimated (in Germany) that the total world recovery of tin from scrap tinplate during 1932 approximated 10,000 tons, of which Germany accounted for 1,500 to 2,000 tons, partly as metal and partly as chloride of tin. There are five detinning plants in Germany, including the pioneer producer, Th. Goldschmidt A.G., Essen, which started detinning operations in 1887. Other world plants are those of the United States, Norway, Italy, France, Spain and Japan. It is alleged in Germany that the Japanese detinning industry has increased the difficulties of securing desirable supplies of scrap material from foreign sources, and that Japanese tin salts have penetrated markets formerly served by Germany.

# Notes and Reports from the Societies

## Society of Glass Technology

### Meeting and Annual Dinner

THE Society of Glass Technology will hold its first meeting for the year on January 8, at 2 p.m., in the Rooms of the Chemical Society, Burlington House, Piccadilly, London. Arrangements are being made for members and their friends to visit the Royal Academy Exhibition of British Art in Industry in the morning, while the annual dinner-dance of the Society will be held at the Trocadero Restaurant the same evening. The Society's guests at the dinner will include Sir W. H. Hadow, former Vice-Chancellor of the University of Sheffield, Sir William Rothenstein, principal of the Royal College of Art, London, and Mr. John A Milne, chairman of the Royal Society of Arts. Tickets price 15s. can be obtained from the Secretary, Darnall Road, Sheffield, 9.

## Society of Chemical Industry

### Liverpool Section : Food as Colloid Systems

DR. W. CLAYTON spoke on "Foods as Colloid Systems" at a meeting of the Liverpool Section of the Society of Chemical Industry held on January 4. Illustrating the stability of emulsoid hydrosols by reference to the application of Kruyt's stability factors as used by Olsen on the pectin-sugar-acid gels, Dr. Clayton went on to describe the Tyndall beam phenomena. Discussing the semi-colloidal substances, he reviewed the various applications of the Tyndall beam effect in food chemistry, mentioning the determination of the iso-electric point of gelatin and the transmission of light by egg-white. Having given recent views on the nature of emulsifying agents, referring specially to the conception of hydrophile/lipophile balance in such agents, Dr. Clayton spoke of the recent work relating to the claims made that protein denaturation is reversible, and concluded his address by a description of recent work concerning the adsorbed film round the fat globules in milk and cream.

## Royal Institution

### Coming Lectures

THE Royal Institution is inaugurating a series of Friday evening discourses, commencing at 9 p.m., from January 18, when Sir William Bragg will speak on "The Theoretical Strength of Materials and their Practical Weakness." On February 1, Mr. F. Simon will deliver a paper on "The Approach to the Absolute Zero of Temperature," while on February 22, Professor A. O. Rankine is describing "Some Experiments in Gravitation and Magnetism"; on March 22, Sir John Russell will discuss "The Future of British Agriculture," and on March 29, the Lord Rutherford of Nelson will describe "The Neutron and Radioactive Transformations."

Lectures, to which non-members of the Royal Institution may be admitted on payment of a subscription, are being given on Tuesdays and Thursdays at 5.15 p.m. and on Saturdays at 3 p.m., and on January 15, 22 and 29, Mr. G. P. Thompson will speak on "Electron Diffraction and its Applications."

## Institution of Chemical Engineers

### Thirteenth Annual Meeting

THE thirteenth annual corporate meeting of the Institution of Chemical Engineers will be held on February 22, at the Hotel Victoria, Northumberland Avenue, London, at 11.0 a.m., when the following retirements from the Council will take place: The president, vice-presidents, hon. secretary, hon. treasurer, Messrs. P. Parrish, F. H. Rogers, F. S. Sinnatt and C. C. H. Brazier. The nominations of the Council for these offices are: President, Dr. H. Levinstein; vice-presidents, Dr. W. Cullen and Dr. F. S. Sinnatt; hon. secretary, Mr. H. W. Cremer; hon. treasurer, Mr. F. A. Greene; members of council, Messrs. W. A. Damon, G. W. Himus, J. W. Napier and L. O. Newton. Associate-members: Messrs. W. R. D. Manning and F. Rumford.

The annual dinner will be held in the evening, the principal speakers being Lord Macmillan and Lord Herbert Scott.

# Imperial College of Science and Technology

## Report for 1929-34

THE policy of the Imperial College of Science and Technology has always been to install special equipment so as to meet the continuous development of the department's research work, and among its outstanding additions during the past five years may be mentioned high-pressure research apparatus, including machines for compressing gases up to 1,000 atmospheres, and various bombs for exploding then at initial pressures up to 1,000 atmospheres whereby maximum explosion pressures up to 10,000 atmospheres are developed.

Practically all the research work in the department is of a fundamental and pioneering character, bearing upon what may be termed the "long distance" problems of industry. Work on the chemical constitution and maturing of coals has resulted in new knowledge bearing upon the origin and development of the main "coking constituents" of bituminous coals, and the discovery not only of the essentially "benzenoid" structure of the main coal substance, but also the development thereof throughout the lignin-peat-lignite-coal-anthracite series.

Several lines of systematic investigation have been carried out on such subjects as the combustion of carbonic oxide, the combustion of hydrocarbons, and flame spectra, resulting in new evidence that carbonic oxide burns in two ways, one involving (and the other *not*) the intervention of steam, and proof that the initial oxidation product of a gaseous hydrocarbon is the corresponding alcohol, as well as the accumulation of much further evidence supporting the "hydroxylation" theory, while work upon gaseous explosions at high pressures has been extended over initial pressures up to 1,000 atmospheres, the highest yet attempted in gaseous explosions.

Dr. D. M. Newitt has developed a new line of work on the pressure-oxidation of typical hydrocarbons with a view to elucidating the mechanism of the process and of obtaining large yields of valuable intermediate products, and has succeeded in obtaining a 50 per cent. yield of methyl alcohol from methane, a 60 per cent. yield of ethyl alcohol from ethane, and large yields of both benzyl alcohol and benzaldehyde from toluene. Investigations have also been carried out on certain liquid organic reactions at a pressure of 5,000 atmos., with such success that apparatus has recently been installed to extend the work up to pressures between 10,000 and 20,000 atmospheres. Another important line of research upon the influence of pressure on the ignition temperature of hydrocarbons has been opened up by Dr. D. T. A. Townend, in the course of which it has been discovered that the ignition temperatures of explosive mixtures of the paraffin hydrocarbons with air, etc., are located in two widely separated ranges, gone usually above 500° C. for low pressures and the other usually below 350° C. for high pressures. Transference of an ignition temperature to the lower range occurs abruptly at a definite critical pressure, and it appears to depend upon the part played by pressure in stabilising certain products formed intermedially during combustion. Research upon the interactions of gases and ore in blast furnace iron smelting has been continued, and is still proceeding.

# News from the Allied Industries

## Iron and Steel

GERMAN PIG-IRON PRODUCTION in 1934 increased by 66 per cent. over 1933 and raw steel production increased by 55 per cent.

## Paper

IT IS THE BELIEF OF THE DIRECTORS of W. V. Bowater and Sons that favourable opportunities may occur in the near future for the development and widening of the company's business and interests, and in order that they may be in a position to take advantage of these opportunities when they arise, they propose that the authorised capital be increased to £800,000 by the creation of 300,000 preference £1 shares and an additional 100,000 £1 ordinary shares. The company made a net profit for the past year of £46,208, and the dividends on the preferred ordinary and ordinary shares are brought up to 10 per cent. for the year in each case.

## Safety Glass

RESOLUTIONS HAVE BEEN PASSED at an extraordinary general meeting of the Plastic Safeglass Syndicate, Ltd., for the sale of the assets to a new company to be formed under the title of the Peerless Safety Glass Co., Ltd., with a nominal capital of £10,000 in £1 shares. Members of the Plastic Company will receive 4,000 fully paid ordinary shares of £1 each in the capital of the new company. The new company will take over all the debts and liabilities of the Plastic Company and discharge the costs and expenses of its voluntary winding-up. Mr. Alfred Louis Passmore, of 74a Regent Street, W., has been appointed liquidator. The 4,000 shares in the new company will be distributed among the members of the Plastic Company by the liquidator. ("London Gazette," December 25, 1934.)

## Mineral Oil

NINETEEN MILLION TONS OF OIL, the estimated output for the year, has been produced by the Azerbaijan (Baku) oilfields before the scheduled time. This total represents an increase of 4,000,000 tons over last year's output. Compared with 1933, drilling increased by almost 50 per cent. The biggest year's output of the Baku oilfields prior to the Russian Revolution was in the neighbourhood of ten million tons.

THE SHEIKH OF KUWAIT, who rules a principality comprising 50,000 people on the north-western coast of the Persian Gulf, has signed an oil concession covering all his territory. The concession grants sole rights to an Anglo-American group stated to be a combination of two powerful oil concerns. It is understood that the British interest is held by the Anglo-Persian Oil Co. The group will operate the concession through a British company named the Kurwait Oil Co., Ltd.

## Non-Ferrous Metals

STATISTICS ISSUED by the International Tin Research and Development Council show an increase of 4,100 tons in the consumption of tin for the year ended October, 1934, as compared with the previous year. World consumption in manufacture for the year ended October, 1934, is given as 132,900 tons, the figure for the previous year being 128,800 tons. The world's "apparent" consumption of tin for the 12 months ending October, 1934, is recorded as 115,000 tons, against 125,100 tons in the previous 12 months.

THE IMPORT DUTIES ADVISORY COMMITTEE is to conduct an inquiry into the working of the present arrangements with regard to the supplies and prices of lead and zinc, and the provisions of the Ottawa Agreement in that connection. There has for some time been a campaign to correct the anomalous position in the lead market, as, while the tariff on foreign lead has brought the Empire producer more of the home market, the price of lead has suffered a severe setback. Home consumers are discouraged from taking foreign metal on account of the duty, so that large stocks have accumulated here, which have depressed the market price abnormally. A similar effect has been produced in the zinc market, and as a consequence the working of the Zinc Cartel has been seriously affected.

## Artificial Silk

AN APPLICATION TO THE HIGH COURT by the official receiver and liquidator of Alliance Artificial Silk, Ltd., has resulted in the appointment of the following persons as a committee of inspection to act with the official receiver as liquidator: Henry Sidgwick, of 28 Pall Mall, holding a general power of attorney from William Hyde Buckley, of Ennerdale, Kirkley Park Road, Lowestoft, Suffolk; Leonard Seymour Adams, of 425 London Road, Mitcham, Surrey, holding a general power of attorney from Compagnie Generale Bregeat, of 24 Rue de la Fidelite, Paris, France; S. E. Leighton, of Bridge House, Mill Road, Lowestoft, holding a general power of attorney from D. Leighton and Son, Ltd.; Francis Hunter Ritchie, of Evelyn House, 62 Oxford Street, London, and John Wilmot, of 78 New Oxford Street, London ("London Gazette," December 25, 1934).

## China Clay

THE CHINA CLAY SHIPMENTS for November although much below the previous month were very encouraging and the year, as foreshadowed in this journal, will, on the whole, reveal a large increase over 1933 and nearly 125,000 tons above 1932. Considering the rough weather experienced in November the shipping records have been excellent. There were no shipments made from either Penzance or Padstow. The details of despatches made are as follows: Fowey, 41,098 tons china clay, 2,891 tons china stone, 748 tons ball clay; Par, 10,146 tons china clay, 254 tons china stone; Charlestown, 6,088 tons china clay, 93 tons china stone; Looe, 240 tons china clay; Plymouth, 88 tons china clay; Newhaven, 10 tons china clay; rail to destination, 5,658 tons china clay. This makes an aggregate tonnage of 67,314 tons or 63,328 tons of china clay, 3,238 tons of china stone and 748 tons of ball clay, compared with 71,354 tons of clay, 3,308 tons of china stone and 2,868 tons of ball clay during October which was a record month for the past three years. As a further indication of the improvement in the industry there is much greater activity in all the clay centres than for some years past. At the Lee Moor China Clay Works of the English China Clays, Ltd., now absorbed in the big three, English Clays, Lovering Pochin and Co., Ltd., there has been a distinct advance in employment.

# New Year Honours

## Science Recognised in New Knighthoods

THE New Year Honours list published on Tuesday contained no names prominently associated with industrial chemistry, but science and education were recognised by the creation of several new knights. Knighthoods were conferred upon: Dr. Charles Vernon Boys, A.R.S.M., LL.D., F.R.S., a past-president of the Physical Society (for services to physics); Professor Walter Langdon-Brown, M.A., M.D., F.R.C.P., Regius Professor of Physic, University of Cambridge; Mr. Edwin Deller, LL.D., principal of the University of London; and Dr. John Boyd Orr, D.S.O., M.C., M.A., M.D., D.Sc., F.R.S., director of the Rowett Institute for Research in Animal Nutrition, Aberdeen (for services to agriculture). Dr. Orr has a world-wide reputation for research into the effect of minerals in cattle feeding.

The distinction of Commander of the Order of the British Empire was conferred upon Dr. Edgar Johnson Allen, D.Sc., LL.D., F.R.S., secretary of the Marine Biological Association of the United Kingdom and director of the Plymouth Laboratory; Mr. Charles Caesar Hawkins, lately superintendent of the Department of Technology, City and Guilds of London Institute (for services to technical education).

Mr. Richard William Harris, secretary of the London School of Hygiene and Tropical Medicine, received the O.B.E., and Mr. Ernest Jones Holmes, senior inspector of textile particulars, Factory Department, Home Office, received the M.B.E.

Lieutenant-General Sir William Furse, K.C.B., D.S.O., director of the Imperial Institute, and Mr. Albert Cherbury David Rivett, M.A., D.Sc., deputy chairman and chief executive officer of the Australian Council of Scientific and Industrial Research, each received the K.C.M.G.

# Weekly Prices of British Chemical Products

## Review of Current Market Conditions

MARKET conditions have been quiet since the re-opening of business due to the holidays and stock-taking period. There are no price changes to report in the markets for rubber chemicals, wood distillation products, pharmaceutical chemicals, perfumery chemicals and intermediates. The all-round reduction of one penny per gal. in the prices of methylated spirits took effect from January 1, and there have been slight fluctuations in certain tar products and essential oils. Unless otherwise stated the prices quoted below cover fair quantities net and naked at sellers' works.

**Price Changes**

**General Chemicals.**—METHYLATED SPIRIT, all round reduction of 1d. per gal. from January 1 (as already announced).

**Coal Tar Products.**—CARBOLIC ACID CRYSTALS, 7¾d. to 8¾d. per lb.; CREOSOTE, B.S.I. specification, 5d. per gal.

**Essential Oils.**—CITRONELLA, Java, 1s. 7d. per lb.; Ceylon, 1s. 5d.

**All other prices remain unchanged.**

LONDON.—In the London chemical market prices still remain firm, and notwithstanding the holidays there is quite a steady demand. There is no change to report in the market prices for coal tar products in London.

MANCHESTER.—Conditions on the Manchester market for chemical products during the greater part of this week have remained under seasonal influences, although with stocktaking operations pretty well completed and with a resumption of more or less normal conditions at the consuming establishments delivery specifications for most of the leading chemicals are beginning to circulate again fairly freely. However, not until about the early part of next week will trade be back to where it was before the holidays. In the meantime, most of the principal consumers have contracted over the early part of the year and with the Lancashire trade outlook reasonably bright it is anticipated that good quantities of the alkali and other bread-and-butter lines will be taken up. For the most part prices continue to show a steady tendency.

SCOTLAND.—Annual stocktakings and Christmas and new year holidays have made the Scottish heavy chemical market dull so far as business is concerned. For a few days business has, in fact, been at a complete standstill.

### General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. less 5%. MANCHESTER: 11½d. to 11¾d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0½d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 5d. to 2s. 9d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3⅞d. to 5d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £32.

LEAD NITRATE.—£27 10s. per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8½d. to 8¾d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38.

POTASSIUM BICHROMATE.—Crystals and Granular, 5s. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10¼d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8½d.
SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £23.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND. Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 10s. per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.
SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON. Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.
SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.
SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER. £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 5s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

## Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¾d. per lb.; crude, 60's, 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 1s. 11d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 5d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3½d. f.o.r. North; 4d. London. MANCHESTER: 4¼d. to 4¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4½d. to 4¾d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160% 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, 48s. per ton. LONDON: 47s. 6d. per ton, f.o.b. East Coast port.
PYRIDINE.—90/140, 6s. 9d. to 2s. 6d. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

## Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
*p* CRESOL 34-5° C.—2s. per lb. in ton lots.
*m*-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
*o*-NITRANILINE.—3ss. 11d. per lb.
*m*-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
*p*-NITRANILINE.—Spot, 1s. 8d. per lb.; d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
*o*-TOLUIDINE.—9½d. to 11d. per lb.
*p*-TOLUIDINE.—1s. 11d. per lb.

## Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £10. Grey, £15 to £16. Liquor, brown, 30° Tw., 7d. to 9d. per gal. MANCHESTER: Brown, £12 10s.; grey, £17 10s.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
AMYL ACETATE, TECHNICAL,—95s. to 110s. per cwt.
CHARCOAL.—£6 5s. to £10 per ton.
WOOD CREOSOTE.—Unrefined, 6d. to 9d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 9d. to 3s. 3d. per gal. Solvent, 3s. 9d. to 4s. 6d. per gal.
WOOD TAR.—£2 to £4 per ton.

## Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Jan., £7 2s.; Feb., £7 3s. 6d.; Mar./June, £7 5s.; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.
CYANAMIDE.—Jan., £7 1s. 3d.; Feb., £7 2s. 6d.; Mar., £7 3s. 9d.; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.
NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid for material basis 15.5% nitrogen.
CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton, for delivery up to June, 1935, in 6-ton lots carriage paid.

## Latest Oil Prices

LONDON, Jan. 2.—LINSEED OIL was steady. Spot, £20 10s. (small quantities 30s. extra); Jan., £19; Jan.-April, £19 5s.; May-Aug., £19 1s. 6d.; Sept.-Dec., £20 5s., naked. SOYA BEAN OIL was firm. Orient (buulk), Jan.-Feb. shipment, £18 5s. per ton, nominal. RAPE OIL was steady. Crude extracted, £28 10s. technical refined, £30, naked, ex wharf. COTTON OIL was strong. Egyptian crude, £21 10s.; refined common edible, £26 10s.; and deodorised, £28, naked, ex mill (small lots 30s. extra). TURPENTINE was firm. American spot, 45s. 3d. per cwt.
HULL.—LINSEED OIL spot, quoted £20 per ton; Jan., £19 10s.; Jan.-April, £19 15s.; May-Aug., £20; Sept.-Dec., £20 7s. 6d., naked. COTTON OIL.—Egyptian, crude, spot, £22 15s.; edible, refined, spot, £25; technical, spot, £25; deodorised, £27, naked. PALM KERNEL OIL, crude, f.m.q., spot, £15 10s., naked. GROUNDNUT OIL, extracted, spot, £25; deodorised, £29. RAPE OIL, extracted, spot, £27 10s.; refined, £29. SOYA OIL, extracted, spot, £19 10s.; deodorised, £22 10s. per ton. CASTOR OIL, Pharmaceutical, 37s.; first, 32s.; second, 29s. per cwt. TURPENTINE, American, spot, 47s. 3d. per cwt.

# Inventions in the Chemical Industry

## Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Complete Specifications Open to Public Inspection

GLAUCONITE, treatment.—United Water Softeners, Ltd. June 19, 1933. 36712/33.

PLATINUM CONTACT MASSES, treatment.—Grasselli Chemical Co. June 22, 1933. 13418-9/34.

PURIFYING SULPHURIC ACID, processes.—Mansfeldscher Kupferschie-Ferbergbau A.-G. June 21, 1933. 14936/34.

CELLULOSE SOLUTIONS.—Röhm and Haas Co. June 19, 1933. 17024/34.

DETECTING CHEMICALLY REACTIVE GASES or vapours in air or other neutral gases, method.—B. Dräger. June 23, 1933. 17199/34.

RAW ALCOHOLIC LIQUORS, maturing and ageing.—Florida Crane Products Corporation. June 22, 1933. 17977/34.

MERCERISATION, process.—Soc. of Chemical Industry in Basle. June 20, 1933. 18123/34.

OILS OF MARINE ORIGIN, treatment.—Dr. S. Schmidt-Nielsen. June 20, 1933. 18186/34.

OIL-SOLUBLE ARTIFICIAL RESINS, making.—Dr. K. Albert Ges. Chemische Fabriken. June 21, 1933. 18252/34.

CARBON DIOXIDE, method and apparatus for discharging aqueous solutions.—M. J. Brown. June 21, 1933. 18378/34.

HORMONES, preparation.—Schering-Kahlbaum A.-G. June 22, 1933. 18394/34.

NITROCELLULOSE, manufacture.—E. I. du Pont de Nemours and Co. June 21, 1933. 18434/34.

AZO DYESTUFFS insoluble in water, manufacture.—I. G. Farbenindustrie. June 23, 1933. 18616/34.

### Applications for Patents

**(December 20 to 24 inclusive.)**

EXPLOSIVES, manufacture.—Aktiebolaget Swedish Invention Corporation. (Sweden, Dec. 21, '33.) 36599.

AZO DYESTUFFS, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 36983.

PHOSPHATES, manufacture.—Briton Ferry Chemical and Manure Co., Ltd., and J. P. Fraser. 36806, 36818.

NON-CYCLIC ORGANIC COMPOUNDS, production.—Carbide and Carbon Chemicals Corporation. (United States, Jan. 5.) 36660.

VINYL COMPOUNDS, polymerisation.—Carbide and Carbon Chemicals Corporation. (United States, Jan. 9.) 36661.

POLYMERISATION PRODUCTS OF OLEFINES, manufacture.—A. Carpmael. 36603.

TITANIUM SALT SOLUTIONS, manufacture.—A. Carpmael (Titanges). 36981.

SYNTHETIC RESINS.—E. I. du Pont de Nemours and Co. 36585.

CELLULOSE ESTERS, production.—E. I. du Pont de Nemours and Co. (United States, Dec. 21, '33.) 36704.

TRANSPARENT MATERIALS from benzyl cellulose, production.—L. S. E. Ellis (Soc. des Usines Chimiques Rhône-Poulenc). 36600.

MAGNESIA REFRACTORIES, production.—Harbison-Walker Refractories Co. (United States, Jan. 4). 36872.

SILICA, purification.—R. Hutchinson and J. A. Newbold. 36713.

BASICALLY-SUBSTITUTED ENOL COMPOUNDS, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 20, '33.) 36604.

SUBSTITUTED AMINOCHRYSENES, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 22, '33.) 36700.

CONDENSATION PRODUCTS, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 23, '33.) 36727.

BASIC PRODUCTS FROM SACCHARIDES, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 23, '33.) 36832.

1:4:5:8-NAPHTHALENE-TETRACARBOXYLIC ACID, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 22, '33.) 36833.

VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie. 36968.

GASES, wet purification.—Imperial Chemical Industries, Ltd. and W. Learmonth. (June 21.) 36730.

DISAZO SALT PREPARATIONS.—Imperial Chemical Industries, Ltd. 36846.

CARBOXYLIC ACIDS and their salts, manufacture.—Imperial Chemical Industries, Ltd. (United States, Aug. 27.) 36847.

VEGETABLE PRODUCE, preservation.—J. Y. Johnson (I. G. Farbenindustrie). 36685.

HALOGEN-AMINO-1,9-ANTHRAPYRIMIDINES, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 36969.

VAT DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 36970.

FUEL AGGLOMERATES, manufacture.—J. de Marillac and J. Sahut. 36724.

CELLULOSE ETHERS, production.—J. E. Pollak (Naamlooze Vennootschap Algemeene Chemische en Technische Maatschappij Achetem). 36605.

PREGNANOLONES, production.—Schering-Kahlbaum A.-G. (Germany, Dec. 23, '33.) 36976-8.

KETO-CYCLOPENTANO-DI-METHYL-TETRADECAHYDRO-PHENANTHROL, production.—Schering-Kahlbaum A.-G. (Germany, Dec. 23, '33.) 36979.

METALLIC SULPHATES, ETC., preparation.—M. Serciron. (Belgium, Jan. 16.) 36696.

PREPARING DETERGENTS.—Standard Oil Development Co. (United States, Dec. 30, '33, and other dates.) 36536-44.

MAGNESIUM ALLOYS.—E. Strasser. (Germany, Dec. 23, '33.) 36863.

### Specifications Accepted with Dates of Application

NITROGENOUS CONDENSATION PRODUCTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 13, 1933. 421,264.

ALKALINE-DYEING LIQUORS, resisting.—Bleachers' Association, Ltd., C. S. Parker, C. L. Wall, and F. Farrington. March 21, 1933. 421,466.

ALIPHATIC DIAMINOCARBOXYLIC ACID DERIVATIVES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). May 20, 1933. 421,407.

VAT DYESTUFFS, process for developing fabrics printed with.—I. G. Farbenindustrie. June 11, 1932. 421,279.

HYDROCARBONS, method of coking.—Brassert-Tidewater Development Corporation. June 24, 1932. 421,408.

FATTY ESTERS, manufacture.—Procter and Gamble Co. Aug. 22, 1932. 421,284.

CELLULOSE DERIVATIVES OR RESINS, manufacture of compositions comprising.—L. P. Kyrides. June 20, 1932. 421,420.

AZO DYESTUFFS containing a heavy metal in a complex form, process for the manufacture.—I. G. Farbenindustrie. June 21, 1932. 421,421.

SULPHUR-DIOXIDE-CONTAINING GASES, treatment.—S. B. McCluskey. June 21, 1933. 421,289.

SULPHUR DIOXIDE to elemental sulphur, processes and apparatus for the reduction.—S. B. McCluskey. June 21, 1933. 421,290.

METHYLAMINES, manufacture and production.—J. Y. Johnson (I. G. Farbenindüstrie). July 10, 1933. 421,486.

FINELY-DIVIDED LEAD or lead oxide, method for the production. P. Kemp and E. Feuer. Sept. 7, 1932. 421,297.

ARTIFICIAL SILK made from regenerated cellulose or acylated cellulose, process for producing white or coloured matt effects.—Soc. of Chemical Industry in Basle. Sept. 24, 1932. 421,360.

BASIC COPPER SULPHATE, process for manufacture.—B. H. Marsh. Nov. 24, 1933. 421,498.

TITANIUM COMPOUNDS OR PIGMENTS, production.—Titan Co., Inc. March 30, 1933. 421,308.

CHLORINATED RUBBER, production.—Chemische Fabrik Buckau. May 26, 1933. 421,313.

GLUCOSIDES, preparation.—H. T. Böhme A.-G. June 3, 1933. 421,318.

CELLULOSE FROM LIGNOCELLULOSIC MATERIALS, production.—H. Dreyfus. June 12, 1933. 421,379.

ADHESIVES.—J. Graham and E. B. Catlow. Aug. 7, 1934. 421,456.

ORGANIC COMPOUNDS, polymerisation.—Triplex Safety Glass Co., Ltd., L. V. D. Scorah, and J. Wilson. April 12, 1933. 421,397.

CELLULOSE ESTERS OR ETHERS, plasticisation.—British Celanese Ltd. April 13, 1932. 421,332.

## Books Received

**Wie setzen wir die Verluste an fluchtigen Losungsmitteln herab?** Dr. E. Schwarz. Berlin: Allgemeiner Industrie-Verlag G.m.b.H. Pp. 150. RM.9.

**The Story of the Royal Society of Arts.** London: John Murray. Pp. 71. 3s. 6d.

THE manufacture in a single process of the purest alcohol, without objectionable smell, has now been made possible in Natal by the installation of a modern plant at Merebank by the Natal Cane By-Products, Ltd. This plant is the most recent invention in alcohol distillation practice. The principal change made is that 99.9 per cent. pure absolute alcohol can be made from the fermented "wash" in one process, thus effectively producing a spirit that was at one time the costly production of the laboratory. The plant was manufactured at Reunis, France, by Pingris et Mollet Fontaine.

# From Week to Week

THE GERMAN BERGIN CO., which makes alcohol from wood to take the place of imported fuel, has closed its accounts for the past year with a loss of 250,000 marks.

NATIVE RUBBER RESTRICTION will be the subject of discussion at a meeting of the High Council to be held at Batavia on January 21.

THE NOMINAL CAPITAL of Gideon Richter (Great Britain), Ltd., has been increased by the addition of £3,000 beyond the registered capital of £15,500.

THE CHILEAN NITRATE AND IODINE SALES CORPORATION has issued the balance sheet for its first financial period, showing disposable profits of £153,865.

DR. W. K. T. BRAUNHOLTZ, speaking to the North-East Industrial Chemists' Society on December 21, appealed for greater efficiency in the coal industry, saying that much could be done towards the rehabilitation of the industry by greater co-ordination in grading, standardisation, and marketing.

BOTTLED GAS is being sold to the occupants of houses and bungalows situated in outlying and otherwise inaccessible country districts round Stockholm. The bottles, which are approximately of eight and a half gallons capacity obviate the necessity of laying lines across stretches of water or difficult marshland.

THE ROYAL SOCIETY OF ARTS has arranged two Cantor lectures on January 28 and February 4 at 8 p.m., by Harriette Chick, on the subject of "Diet and Climate." On February 6 at 8.30 p.m. Sir Frederick Gowland Hopkins is speaking on "The Study of Human Nutrition—the Outlook To-day."

THE MEMBERSHIP OF THE BRITISH ROAD FEDERATION, which has recently been increased by the Scottish Federation of Aerated Water Manufacturers' and Bottlers' Associations being admitted to membership, now consists of thirty-four national organisations which together cover all the various interests of the commercial road motor transport industry.

THE IMPORT DUTIES ADVISORY COMMITTEE has received an application for the reduction of the import duty on primary battery air depolarising carbon blocks. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than January 26.

IT IS NOT OFTEN that a new translation of an economic work is undertaken nine years after its first publication. That has happened, however, in the case of Sir Ernest Benn's classic—"The Confessions of a Capitalist." The publishing house of Meulenhoff, of Amsterdam, has just issued "Bekentenissen van een Kapitalist," the translation having been undertaken by E. C. van Dorp. There are now very few European languages into which this book has not been translated.

MR. L. B. BEALE, Commercial Counsellor at Shanghai, is at present in this country on an official visit. Mr. Beale will be available at the Department of Overseas Trade for the period January 14 to 18 for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to China, after which he will visit a number of industrial centres in the provinces. Firms desiring an interview with Mr. Beale in London or information regarding his arrangements to visit provincial centres should apply to the Department of Overseas Trade, 35 Old Queen Street, London, S.W.1, quoting reference 5529/1/34.

SCOTTISH OILS, LTD., have decided upon important developments in the oil industry in the West Calder district early this year. The company is to sink two shafts to the Dunnet shale at a depth of about 75 fathoms. The new pit will not be far from the housing scheme on the west side of the village, and the sinking of the shafts will provide employment for a large number of men for the greater part of the year. Young's Oil Co. has also decided to erect a new power station at the Addiewell oil works to generate electricity for the new pit. The company's colliery at West Mains will be changed over from steam power to electricity when the power station is completed. The new development will provide employment for shale miners and oil workers for a long time.

A NUMBER OF CONFIDENTIAL REPORTS on chemical trade conditions overseas have been issued by the Department of Overseas Trade to firms whose names are entered on its special register. United Kingdom firms desirous of obtaining copies of the following reports, together with particulars of the special register service of information, should apply to the Department of Overseas Trade, 35 Old Queen Street, S.W.1, quoting the reference numbers in each instance: Markets in Canada for bichromates of potassium and sodium, and sodium hydrosulphite (F.Y.2194); markets for heavy chemicals in Portugal (F.Y.2201); markets in the Netherlands for bichromates of sodium and potassium, hydrogen peroxide and hydrosulphites (F.Y.2210); and markets in the Netherlands East Indies for alum, aluminium sulphate, hydrogen peroxide and hydrosulphites (F.Y.2211); markets for bichromates of sodium and potassium, hydrogen peroxide, alums and hydrosulphites in Argentina (F.Y.2183).

THE NOMINAL CAPITAL of Erinold, Ltd., has been increased by the addition of £55,000 beyond the registered capital of £275,000.

THE BERLIN MUNICIPAL GASWORKS have placed an order with the firm of Koppers, Essen, for the erection of a coke oven installation at the Berlin-Lichtenberg Gasworks.

COAL AND ALLIED INDUSTRIES, LTD., have commenced work on their new factory at Seaham Harbour for the production of motor spirit from coal.

J. J. HADFIELD, LTD., the Manchester and Chinley firm of bleachers and dyers, have completed their striking recovery from the effects of the fire which entirely destroyed their finishing- and making-up rooms last August, by re-starting these departments and employing again the firm's full complement of 250.

THE FINNISH GOVERNMENT has appointed a committee of experts to investigate the possibility of Finnish raw materials being used for fuel purposes. This committee has chosen a special commission consisting of General Sihvo, Professor Kyrklund and Mr. Hormi to discuss the utilisation of Finnish peat for the manufacture of liquid fuel and lubricating oils.

DEVON COUNTY COUNCIL invites tenders for the supply during the twelve months ending March 31, 1936, of refined tar, bitumen and bituminous or tar bitumen compounds, Portland cement, cotton waste, paints, petrol and paraffin, explosives, etc. Tenders on the forms provided have to be delivered by noon, on January 24.

## Compliments of the Season

### Calendars and Diaries Received

SEVERAL firms in the chemical and allied industries have given expression to their optimism and good wishes for the new year by issuing calendars and diaries. We take this opportunity of thanking those who have sent us the gifts referred to below and of reciprocating the good wishes.

From the Staveley Coal and Iron Co., Ltd., we have received a leather-bound pocket diary with a refill for the second half of the year. The company's book of chemical data which in previous years has accompanied the diary is being enlarged and will be issued separately.

As usual, the wall calendar of the Clayton Aniline Co., Ltd., is noteworthy for its fine range of colour. This year's picture is a reproduction of "His Seventieth Birthday," an oil painting by M. Dovaston. An old gentleman of sporting proclivities, suffering probably as much from boredom as from pain, is shown finding relaxation and interest in witnessing a cock-fight which his friends have arranged in celebration of his birthday; the scene is early Georgian.

From Evershed and Vignoles, Ltd., electrical and mechanical engineers, we have received an attractive monthly tear-off calendar, each sheet bearing an excellent reproduction of a photograph of "little ships" taken by Lieut.-Col. W. A. Vignoles, managing director, or his personal friends.

Carty and Son, Ltd., express the season's greetings in the form of refill cards for their calendar.

A monthly tear-off calendar illustrating a wide range of the firm's products comes from Dexine, Ltd., and a similar calendar has been received from Crofts (Engineers), Ltd. High Speed Steel Alloys, Ltd., convey greetings by card from Widnes. Imperial Airways, Ltd., have sent out a sheet almanac in rich colouring inviting everyone to "Fly Imperial Airways."

## New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to January 19, 1935.

**Vitrox.** 554,659. Class 1. A chemical substance for rendering iron enamels opaque. Harrison & Son (Hanley), Ltd., Phoenix Chemical Works, Bath Street, Hanley, Stoke-on-Trent. October 11, 1934.

**Hadriavar.** 555,008. Class 1. Paints, varnishes, enamels (in the nature of paint), colours, distempers, japans, lacquers, paint and varnish driers, wood preservatives, wood stains, anti-corrosive and anti-fouling compositions, and anti-corrosive oils. Smith & Walton, Ltd., Hadrian Works, Haltwhistle. October 24, 1934.

**Vitaglo.** 555,744. Class 1. Paints, varnishes, enamels (in the nature of paints) and anti-corrosive oils. W. & J. Leigh, Ltd., Jubilee Buildings, 71 Bark Street, Bolton. November 19, 1934.

# New Companies Registered

**Bovall (Sales), Ltd.,** First Avenue House, High Holborn, London.—Registered December 22. Nominal capital £1,000. Manufacturers of and dealers in chemicals, gases, drugs, medicines, disinfectants, fertilisers, salts, acids, oils, colours, quill pens, tooth picks, toilette requisites, and preparations, perfumes, and proprietary articles; chemists, druggists, etc. A subscriber: Ethel M. Hubbard.

**British Cellophane, Ltd.**—Registered January 1. Nominal capital, £900,000. Manufacturers of and dealers in films, sheets and plates, viscose, transparent and other paper, yarns, fabrics and other goods, materials and things made therefrom or from cotton, wool, silk, wood, chemical substances or any other materials or products, whether mechanically, electrically, chemically or otherwise; manufacturers of and dealers in wrappings, packings and covers of all kinds, etc. A subscriber: Hugh D. P. Francis, 62 London Wall, London, E.C.2.

**R. H. Cole and Co., Ltd.,** Spencer House, South Place, London, Registered January 1. Nominal capital £3,000. To acquire the business of dealers in resins, gums, cellulose, paints and plastics, carried on at Spencer House, South Place, E.C.2, as "R. H. Cole & Company." Directors: Reginald H. Cole, Wm. H. Wiles.

**Evans, Sons, Lescher and Webb (Ireland), Ltd.**—Registered December 20. Nominal capital £1,000. Manufacturing, dispensing and pharmaceutical chemists, druggists, drug merchants, dry salters, etc. Directors: Thomas J. Moran, "Sembury," Seafield Road, Clontarf; Dermot Glavey, William Rowland, Thomas E. Lescher.

**H. Ferguson and Co., Ltd.,** 6 Queen's Road, Reading.—Registered December 29. Nominal capital £500. To acquire the business of electrical and chemical engineers carried on by John R. Bayes and Henry C. Williams, as "H. Ferguson and Co.," at 8 Queen's Road, Reading, Berks. Directors: John R. Bayes, Arthur D. Robinson, Sydney Hague.

**Gardinol Chemical Co., Ltd.,** 78 and 80 New Street, Milnsbridge, Huddersfield.—Registered December 24. Nominal capital, £1,000. Manufacturers of and dealers in sulphonated fatty alcohols and other products. Directors: Dr. Alfred F. Kertess, Ph.D., Dr. Arthur E. Everest.

**J. B. Goodman, Ltd.,** Empire House, 68 Finsbury Pavement, E.C.2.—Registered December 24. Nominal capital £100. Manufacturers of and dealers in enamels, paints, varnishes, polishes, colours, dyes, oils, etc. Directors: Jacob B. Goodman, Lena Goodman.

**Macclesfield Paint Manufacturing Co., Ltd.,** 15a Pearl Street, Beech Lane, Macclesfield.—Registered December 20. Nominal capital £1,100. Manufacturers of paints, colours, varnishes and chemicals, etc. Directors: Colin Blackett, Richard J. H. Rothwell.

**William Dixon and Co. (Isleworth), Ltd.,** 240 Twickenham Road, Isleworth, Middlesex.—Registered December 29. Nominal capital £500. Manufacturers of and dealers in cellulose, lacquer, nitro-glycerine products, oils, colours, paaints, pigments and varnishes, and cellulose and paint and varnish machinery, etc. Directors: Wm. Dixon, Mrs. Phyllis Dixon, Mrs. Grace Blanks.

# Company News

**Yorkshire Dyeware and Chemical Co.**—A dividend of 2½ per cent. was announced payable on December 31.

**International Carbonising Co.**—The report for the year to June 30, 1934, shows a loss of £326, increasing the debit to £19,075.

**New Transvaal Chemical Co.**—A final dividend of 4 per cent., less tax, is announced on the "A" preference shares.

**Anglo-Persian Oil Co.**—Dividends on the 8 per cent. cumulative first preference shares and 9 per cent. cumulative second preference stock have been declared payable on January 31, 1935.

**Central Oil Mining and Chemicals Trust.**—The report for the year ended April 30, 1934, states that revenue account shows a debit balance of £1,179 against a loss of £733 in the previous year, which, after adding £8,682 brought forward from previous year, makes a debit balance of £9,861 to be carried forward.

**Hadfields, Ltd.**—The directors state that although the improvement in trade has been maintained, they have decided to defer payment of the 4½ per cent. cumulative preference dividend, due on December 31. A similar announcement was made with reference to the dividend due on June 30. The dividend on the shares is now in arrear for the four years 1931-1934. The last dividend paid on the ordinary shares was 2½ per cent. for 1929.

**Leeds Fireclay Co.**—For the year to June 30 last, the report shows a trading balance £70,804; after expenses and charges, including £25,281 for repairs and depreciation, there is a loss of £1,001, against a loss of £17,722. Debenture interest absorbs £8,775, making year's debit £9,777, which is met by £3,319 brought in and £6,457 transferred from reserve fund.

# Forthcoming Events

**LONDON.**

**Jan. 7.**—Society of Chemical Industry (London Section, and Food Group). "The Fats: New Lines in an Old Chapter of Organic Chemistry." Professor T. P. Hilditch (Jubilee Memorial Lecture). 8 p.m. Burlington House, Piccadilly, London.

**Jan. 8.**—Society of Glass Technology. 2 p.m. Burlington House, Piccadilly, London. Annual Dinner. 7.15 p.m. Trocadero Restaurant, Piccadilly, London.

**Jan. 8.**—Pharmaceutical Society of Great Britain. "Vocational Guidance." C. A. Oakley. 8.30 p.m. 17 Bloomsbury Square, London.

**Jan. 9.**—Institution of Chemical Engineers. Joint meeting with the London Section of the Society of Glass Technology. "A Review of Some of the Problems of the Glass Bottle Industry." W. A. Moorshead. 6 p.m. Burlington House, London.

**Jan. 10.**—Institute of Metals (London Section). "The Manufacture and Uses of Powdered Metals." J. C. Chaston. 7.30 p.m. 83 Pall Mall, London.

**BELFAST.**

**Jan. 7.**—Institute of Chemistry (Belfast Section). "The Neutron and Positive Electron." Professor K. G. Emeleus. Belfast.

**LEICESTER.**

**Jan. 9.**—Institution of the Rubber Industry (Leicester Sub-Section). "Developments in the Chemical Technology of Rubber." Dr. D. F. Twiss. College of Technology, Leicester.

**LIVERPOOL.**

**Jan. 10.**—Institute of Chemistry (Liverpool Section). "Some Applications of Absorption Spectra." Dr. R. A. Morton. 7.30 p.m. Constitutional Club, India Buildings, Water Street, Liverpool.

**LOUGHBOROUGH.**

**Jan. 10.**—Society of Dyers and Colourists (Midlands Section). "Lubricants and Lubrication of Hosiery Yarns." (Joint meeting with the Textile Institute). W. E. Boswell. Loughborough.

**MANCHESTER.**

**Jan. 10.**—Institute of Chemistry (Manchester Section). "Laboratory Animals, their Causes and Cure." A. L. Bacharach. 7 p.m. Manchester.

**Jan. 11.**—Oil and Colour Chemists' Association (Manchester Section). "Properties of Pigment Powders." G. A. Campbell. College of Technology, Manchester.

**PRESTON.**

**Jan. 7.**—Institution of the Rubber Industry (Preston and District Section). "Accelerators—their History and Uses and Methods of Controlling their action." Maldwyn Jones. Victoria and Station Hotel, Preston.

**SWANSEA.**

**Jan. 11.**—Society of Chemical Industry (South Wales Section). "Hydrogenation." Dr. W. Idris Jones. 7 p.m. Thomas' Cafe, High Street, Swansea.

# Chemical Trade Inquiries

**The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).**

**Egypt.**—The Prisons Administration, Cairo, invite tenders for the supply of caustic soda for soap-making, within a period of one year commencing from May 1, 1935, and ending on April 30, 1936. Tenders will be received up to noon on January 24, and shall remain in force for a period of 45 days from that date. Further particulars are obtainable on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1, quoting reference 29084/1934.

**Canada.**—A mechanical engineer resident in Vancouver desires to secure agencies, on a commission basis, of United Kingdom manufacturers of machinery and equipment (any class); power plant equipment; laundry machinery; mining equipment and accessories; gas, oil, diesel and steam engines—marine or stationary types, for the Province of British Columbia. (Ref. No. 4.)

**South Africa.**—A former employee of a South African rubber company, who proposes shortly to establish himself as a manufacturers' representative in Johannesburg, desires to secure the representation of United Kingdom manufacturers of rubber goods, including (I) rubber flooring, (II) chemists' sundries (rubber), (III) mechanical rubber goods, for the Union of South Africa and Southern Rhodesia. The applicant is at present in the United Kingdom. (Ref. No. 9.)

**Belgium.**—An agent and importer established at Antwerp wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of dry colours; gums and resin; wood oils; shellac. (Ref. No. 12.)